DIELECTRIC PROPERTIES OF ALBERT COUNTY OIL SHALE
APPENDIX I. DIELECTRIC CONSTANT DATA

Open File Report 82-17

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Department of Natural Resources
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DIELECTRIC PROPERTIES OF ALBERT COUNTY OIL SHALE

APPENDIX I. DIELECTRIC CONSTANT DATA

Mineral Resources Division
Department of Natural Resources
New Brunswick

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DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CS A1-01PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.100	12.078	12.070	48.954	48.954	1.840	4.26	1.0204	2.38
2.200	5.358	5.358	11.770	11.769	1.840	4.16	0.0371	57.31
2.300	7.456	7.457	4.845	4.845	1.840	4.53	0.0364	53.57
2.400	9.661	9.661	4.505	4.505	1.840	4.11	0.0304	64.61
2.450	10.256	10.257	3.770	3.770	1.840	4.12	0.0321	59.85
2.500	12.092	12.093	3.215	3.215	1.840	4.12	0.0303	61.94
2.600	14.689	14.690	2.435	2.435	1.840	4.13	0.0304	59.38
2.700	16.730	16.731	1.900	1.900	1.840	4.14	0.0318	54.59
2.800	19.724	19.725	1.515	1.515	1.840	4.15	0.0315	53.13
2.900	21.577	21.578	1.245	1.245	1.840	4.14	0.0325	49.74
3.000	24.660	24.662	1.010	1.010	1.840	4.16	0.0322	48.38
3.100	28.054	28.056	0.850	0.850	1.840	4.14	0.0309	49.00
3.200	30.620	30.621	0.730	0.730	1.840	4.09	0.0302	48.91
3.300	29.141	29.142	0.620	0.620	1.840	4.05	0.0338	42.55
3.400	33.189	33.191	0.520	0.520	1.840	4.03	0.0315	44.36
3.500	32.137	32.138	0.405	0.405	1.840	4.09	0.0354	38.11
3.600	32.999	33.000	0.340	0.340	1.840	4.04	0.0356	37.00
3.700	37.748	37.750	0.275	0.275	1.840	4.02	0.0323	39.88
3.800	40.087	40.088	0.185	0.185	1.840	4.10	0.0323	38.34
3.900	41.091	41.092	0.130	0.130	1.840	4.09	0.0322	37.54
4.000	41.976	41.976	0.075	0.075	1.840	4.10	0.0321	36.72

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CS A1-02P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.200	3.673	3.673	4.357	4.357	1.953	4.68	0.0885	22.67
2.300	5.708	5.709	3.042	3.042	1.953	4.65	0.0764	25.21
2.400	7.120	7.121	2.152	2.152	1.953	4.68	0.0804	22.87
2.450	7.798	7.799	1.857	1.857	1.953	4.69	0.0818	22.01
2.500	8.790	8.791	1.602	1.602	1.953	4.72	0.0807	21.78
2.600	9.784	9.784	1.217	1.217	1.953	4.77	0.0869	19.37
2.700	9.462	9.463	0.987	0.987	1.953	4.72	0.0999	16.32
2.800	10.827	10.827	0.757	0.757	1.953	4.79	0.1004	15.53
2.900	12.764	12.765	0.617	0.617	1.953	4.77	0.0920	16.38
3.000	12.809	12.809	0.477	0.477	1.953	4.80	0.1003	14.49
3.100	12.882	12.883	0.347	0.347	1.953	4.87	0.1091	12.80
3.200	8.995	8.995	0.227	0.227	1.953	4.89	0.1705	7.94
3.300	8.492	8.492	0.277	0.277	1.953	4.44	0.1620	8.50
3.400	10.654	10.654	0.257	0.257	1.953	4.30	0.1259	10.77
3.500	13.677	13.677	0.147	0.147	1.953	4.47	0.1055	12.25
3.600	12.023	12.023	0.072	0.072	1.953	4.50	0.1240	10.11
3.700	11.521	11.521	0.062	0.062	1.953	4.29	0.1254	9.95
3.800	14.706	14.706	4.689	4.689	1.953	4.44	0.0997	11.96
3.900	15.049	15.049	4.459	4.459	1.953	4.48	0.0960	12.05
4.000	16.106	16.106	4.268	4.268	1.953	4.42	0.0867	13.10

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX A1-03P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	25.410	25.410	3.030	3.030	1.0050	4.05	0.0653	8.86
8.400	24.182	24.181	2.810	2.810	1.0050	4.07	0.0658	8.56
8.600	24.378	24.377	2.629	2.629	1.0050	4.02	0.0618	8.97
8.800	23.361	23.360	2.451	2.451	1.0050	4.11	0.0596	9.98
9.000	21.627	21.626	2.296	2.296	1.0050	4.14	0.0582	8.95
9.200	19.724	19.723	2.164	2.164	1.0050	4.12	0.0579	8.84
9.400	16.827	16.826	2.032	2.032	1.0050	4.16	0.0586	8.51
9.600	12.927	12.926	1.924	1.924	1.0050	4.10	0.0686	7.16
9.800	11.682	11.681	1.807	1.807	1.0050	4.13	0.0635	7.56
10.000	9.572	9.571	1.676	1.676	1.0050	4.21	0.0591	7.88
10.200	8.147	8.146	1.572	1.572	1.0050	4.19	0.0581	7.47
10.400	7.096	7.095	1.458	1.457	1.0050	4.19	0.0533	8.42
10.600	5.781	5.780	1.340	1.340	1.0050	4.19	0.0523	8.42
10.800	4.597	4.596	1.192	1.192	1.0050	4.23	0.0499	8.62
11.000	3.664	3.664	1.066	1.066	1.0050	4.22	0.0530	7.97
11.200	3.073	3.073	0.916	0.916	1.0050	4.23	0.0552	7.51
11.400	2.917	2.917	0.778	0.778	1.0050	4.22	0.0556	7.34
11.600	3.232	3.232	0.662	0.662	1.0050	4.19	0.0513	7.83
11.800	3.631	3.631	0.553	0.553	1.0050	4.18	0.0494	8.00
12.000	4.251	4.251	0.445	0.445	1.0050	4.21	0.0487	7.96
12.200	5.182	5.183	0.320	0.320	1.0050	4.32	0.0524	7.18

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX 41-03PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	40.411	40.411	0.043	0.043	1.0100	3.65	0.0371	16.41
8.400	37.801	37.801	2.850	2.850	1.0100	3.77	0.0403	14.52
8.600	39.673	39.673	2.681	2.681	1.0100	3.65	0.0365	15.90
8.800	39.446	39.446	2.491	2.491	1.0100	3.80	0.0358	15.54
9.000	36.016	36.015	2.343	2.343	1.0100	3.79	0.0370	14.71
9.200	33.574	33.573	2.207	2.207	1.0100	3.80	0.0369	14.43
9.400	29.717	29.715	2.080	2.080	1.0100	3.82	0.0378	13.72
9.600	24.831	24.830	1.979	1.979	1.0100	3.74	0.0423	12.14
9.800	24.071	24.069	1.862	1.862	1.0100	3.80	0.0378	13.22
10.000	22.856	22.854	1.741	1.741	1.0100	3.88	0.0324	14.94
10.200	19.297	19.295	1.637	1.637	1.0100	3.89	0.0323	14.71
10.400	14.488	14.486	1.543	1.542	1.0100	3.87	0.0367	12.71
10.600	9.376	9.375	1.430	1.430	1.0100	3.91	0.0446	10.20
10.800	6.216	6.215	1.357	1.357	1.0100	3.85	0.0609	7.40
11.000	4.983	4.982	1.296	1.296	1.0100	3.76	0.0712	6.29
11.200	5.656	5.655	1.191	1.191	1.0100	3.75	0.0517	8.51
11.400	6.942	6.941	1.068	1.068	1.0100	3.77	0.0339	12.71
11.600	7.516	7.515	0.942	0.942	1.0100	3.78	0.0264	15.99
11.800	7.534	7.534	0.828	0.828	1.0100	3.78	0.0240	17.32
12.000	7.586	7.586	0.692	0.692	1.0100	3.82	0.0228	17.86
12.200	8.204	8.204	0.577	0.577	1.0100	3.83	0.0220	18.20

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX A1-04P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	25.351	25.351	3.027	3.027	1.0050	4.07	0.0657	8.78
8.400	24.071	24.070	2.800	2.800	1.0050	4.14	0.0663	8.42
8.600	23.796	23.795	2.626	2.626	1.0050	4.04	0.0633	8.73
8.800	22.439	22.438	2.439	2.439	1.0050	4.19	0.0611	8.68
9.000	24.182	24.180	2.273	2.273	1.0050	4.30	0.0491	10.41
9.200	16.749	16.748	2.152	2.152	1.0050	4.20	0.0659	7.68
9.400	12.162	12.161	2.015	2.015	1.0050	4.27	0.0763	6.44
9.600	9.716	9.715	1.919	1.919	1.0050	4.15	0.0896	5.45
9.800	9.627	9.626	1.797	1.797	1.0050	4.18	0.0738	6.46
10.000	8.810	8.809	1.666	1.666	1.0050	4.25	0.0615	7.53
10.200	7.261	7.260	1.552	1.552	1.0050	4.26	0.0601	7.55
10.400	5.082	5.081	1.438	1.437	1.0050	4.27	0.0683	6.51
10.600	3.323	3.322	1.325	1.325	1.0050	4.28	0.0838	5.20
10.800	2.723	2.723	1.282	1.282	1.0050	4.15	0.1015	4.28
11.000	3.090	3.090	1.183	1.183.	1.0050	4.06	0.0794	5.43
11.200	3.173	3.173	1.036	1.036	1.0050	4.07	0.0628	6.73
11.400	3.188	3.188	0.876	0.876	1.0050	4.10	0.0539	7.68
11.600	3.467	3.467	0.727	0.727	1.0050	4.11	0.0476	8.53
11.800	3.824	3.824	0.608	0.608	1.0050	4.11	0.0450	8.86
12.000	4.426	4.426	0.487	0.487	1.0050	4.14	0.0439	8.90
12.200	5.188	5.189	0.405	0.405	1.0050	4.14	0.0429	8.95

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX 41-04PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	41.783	41.784	0.055	0.055	1.0100	3.58	0.0351	17.52
8.400	39.039	39.039	0.020	0.020	1.0100	3.61	0.0375	15.94
8.600	41.352	41.352	2.691	2.691	1.0100	3.59	0.0347	16.91
8.800	40.598	40.598	2.516	2.516	1.0100	3.64	0.0346	16.46
9.000	37.154	37.153	2.358	2.358	1.0100	3.69	0.0362	15.26
9.200	34.594	34.593	2.227	2.227	1.0100	3.67	0.0367	14.77
9.400	28.940	28.939	2.100	2.100	1.0100	3.70	0.0405	13.04
9.600	18.514	18.513	2.044	2.044	1.0100	3.36	0.0637	8.52
9.800	14.962	14.961	1.887	1.887	1.0100	3.66	0.0660	7.71
10.000	18.260	18.259	1.781	1.781	1.0100	3.69	0.0471	10.55
10.200	19.275	19.273	1.682	1.682	1.0100	3.70	0.0386	12.61
10.400	16.924	16.922	1.578	1.577	1.0100	3.74	0.0362	13.12
10.600	12.618	12.616	1.475	1.475	1.0100	3.77	0.0396	11.72
10.800	8.650	8.649	1.377	1.377	1.0100	3.78	0.0475	9.58
11.000	5.495	5.494	1.293	1.293	1.0100	3.76	0.0642	6.98
11.200	4.803	4.802	1.246	1.246	1.0100	3.64	0.0721	6.20
11.400	6.361	6.360	1.136	1.136	1.0100	3.65	0.0441	9.94
11.600	7.568	7.567	1.035	1.035	1.0100	3.64	0.0316	13.66
11.800	7.998	7.997	0.908	0.908	1.0100	3.67	0.0251	16.84
12.000	8.128	8.128	0.787	0.787	1.0100	3.68	0.0223	18.54
12.200	8.414	8.414	0.667	0.667	1.0100	3.70	0.0210	19.36

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX 41-05P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	27.797	27.797	3.030	3.030	1.0100	4.02	0.0593	9.80
8.400	26.092	26.092	2.810	2.810	1.0100	4.03	0.0605	9.35
8.600	25.498	25.498	2.636	2.636	1.0100	3.94	0.0586	9.54
8.800	24.917	24.916	2.451	2.451	1.0100	4.07	0.0555	9.69
9.000	23.659	23.658	2.303	2.303	1.0100	4.06	0.0537	9.81
9.200	22.284	22.283	2.167	2.167	1.0100	4.06	0.0514	10.03
9.400	19.476	19.475	2.045	2.045	1.0100	4.04	0.0526	9.60
9.600	15.542	15.541	1.924	1.924	1.0100	4.06	0.0569	8.68
9.800	10.069	10.068	1.807	1.807	1.0100	4.09	0.0736	6.55
10.000	12.531	12.529	1.691	1.691	1.0100	4.10	0.0482	9.77
10.200	10.765	10.764	1.582	1.582	1.0100	4.10	0.0461	10.02
10.400	8.580	8.579	1.483	1.482	1.0100	4.07	0.0487	9.34
10.600	6.910	6.909	1.360	1.360	1.0100	4.10	0.0470	9.45
10.800	5.408	5.407	1.257	1.257	1.0100	4.07	0.0506	8.66
11.000	4.462	4.461	1.143	1.143	1.0100	4.06	0.0512	8.41
11.200	3.890	3.890	1.014	1.014	1.0100	4.05	0.0498	8.50
11.400	3.802	8.802	0.886	0.886	1.0100	4.04	0.0458	9.09
11.600	3.936	3.936	0.772	0.772	1.0100	4.02	0.0425	9.65
11.800	4.159	4.159	0.648	0.648	1.0100	4.02	0.0409	9.87
12.000	4.529	4.529	0.532	0.532	1.0100	4.04	0.0409	9.69
12.200	5.117	5.117	0.445	0.445	1.0100	4.03	0.0406	9.59

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX 41-05PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	40.551	40.551	0.073	0.073	1.0100	3.49	0.0348	17.89
8.400	38.592	38.592	0.023	0.023	1.0100	3.59	0.0378	15.87
8.600	40.551	40.551	0.015	0.015	1.0100	3.47	0.0344	17.34
8.800	39.264	39.264	2.521	2.521	1.0100	3.60	0.0358	16.04
9.000	38.592	38.592	2.368	2.368	1.0100	3.63	0.0349	15.97
9.200	37.931	37.930	2.237	2.237	1.0100	3.61	0.0337	16.22
9.400	36.308	36.307	2.115	2.115	1.0100	3.61	0.0330	16.22
9.600	31.405	31.404	2.009	2.009	1.0100	3.57	0.0357	14.75
9.800	28.973	28.971	1.882	1.882	1.0100	3.69	0.0334	15.18
10.000	26.394	26.392	1.771	1.771	1.0100	3.74	0.0314	15.72
10.200	22.131	22.129	1.677	1.677	1.0100	3.72	0.0330	14.72
10.400	17.989	17.987	1.583	1.582	1.0100	3.72	0.0347	13.70
10.600	14.454	14.452	1.490	1.490	1.0100	3.71	0.0367	12.72
10.800	12.531	12.529	1.387	1.387	1.0100	3.74	0.0342	13.37
11.000	11.574	11.573	1.298	1.298	1.0100	3.72	0.0314	14.31
11.200	10.280	10.279	1.186	1.186	1.0100	3.74	0.0283	15.57
11.400	9.419	9.418	1.063	1.063	1.0100	3.77	0.0249	17.40
11.600	8.561	8.560	0.962	0.962	1.0100	3.75	0.0240	17.67
11.800	7.709	7.709	0.848	0.848	1.0100	3.75	0.0240	17.41
12.000	7.371	7.371	0.727	0.727	1.0100	3.77	0.0237	17.28
12.200	7.630	7.630	0.617	0.617	1.0100	3.77	0.0232	17.33

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX 41-06P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	25.645	25.645	3.025	3.025	1.0100	4.05	0.0646	8.95
8.400	23.906	23.905	2.805	2.805	1.0100	4.07	0.0663	8.50
8.600	23.933	23.932	2.621	2.621	1.0100	4.04	0.0624	8.85
8.800	22.080	22.079	2.446	2.446	1.0100	4.10	0.0624	8.59
9.000	20.488	20.487	2.293	2.293	1.0100	4.12	0.0608	8.59
9.200	19.275	19.274	2.157	2.157	1.0100	4.12	0.0579	8.83
9.400	16.788	16.787	2.022	2.022	1.0100	4.17	0.0565	8.79
9.600	13.677	13.676	1.919	1.919	1.0100	4.09	0.0635	7.75
9.800	12.474	12.473	1.792	1.792	1.0100	4.15	0.0559	8.55
10.000	10.740	10.739	1.671	1.671	1.0100	4.18	0.0518	9.02
10.200	8.630	8.629	1.562	1.562	1.0100	4.17	0.0530	8.65
10.400	6.816	6.815	1.458	1.457	1.0100	4.15	0.0556	8.10
10.600	5.508	5.507	1.320	1.320	1.0100	4.19	0.0518	8.50
10.800	4.325	4.324	1.197	1.197	1.0100	4.19	0.0537	8.04
11.000	3.548	3.548	1.063	1.063	1.0100	4.19	0.0547	7.76
11.200	3.090	3.090	0.921	0.921	1.0100	4.18	0.0554	7.52
11.400	2.985	2.985	0.788	0.788	1.0100	4.17	0.0547	7.50
11.600	3.162	3.162	0.652	0.652	1.0100	4.17	0.0529	7.62
11.800	3.614	3.614	0.558	0.558	1.0100	4.14	0.0496	8.02
12.000	4.232	4.232	0.510	0.510	1.0100	4.07	0.0448	8.81
12.200	5.052	5.053	0.380	0.380	1.0100	4.15	0.0465	8.25

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX 41-06PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	40.879	40.879	0.038	0.038	1.0100	3.68	0.0371	16.38
8.400	38.815	38.815	2.850	2.850	1.0100	3.77	0.0392	14.91
8.600	40.087	40.087	2.679	2.679	1.0100	3.66	0.0362	16.01
8.800	39.582	39.582	2.496	2.496	1.0100	3.76	0.0357	15.67
9.000	37.282	37.281	2.343	2.343	1.0100	3.79	0.0358	15.23
9.200	36.141	36.140	2.207	2.207	1.0100	3.80	0.0343	15.54
9.400	34.954	34.952	2.080	2.080	1.0100	3.82	0.0322	16.15
9.600	28.281	28.279	1.972	1.972	1.0100	3.78	0.0364	14.02
9.800	28.087	28.085	1.859	1.859	1.0100	3.81	0.0321	15.56
10.000	24.378	24.376	1.746	1.746	1.0100	3.86	0.0310	15.68
10.200	19.999	19.997	1.642	1.642	1.0100	3.87	0.0318	14.98
10.400	16.634	16.632	1.553	1.552	1.0100	3.83	0.0333	14.08
10.600	13.535	13.534	1.440	1.440	1.0100	3.87	0.0322	14.19
10.800	11.092	11.091	1.342	1.342	1.0100	3.86	0.0327	13.74
11.000	9.473	9.472	1.248	1.248	1.0100	3.84	0.0325	13.63
11.200	7.647	7.646	1.136	1.136	1.0100	3.84	0.0330	13.16
11.400	6.561	6.560	1.013	1.013	1.0100	3.86	0.0320	13.34
11.600	6.081	6.081	0.907	0.907	1.0100	3.84	0.0310	13.55
11.800	6.074	6.074	0.798	0.798	1.0100	3.82	0.0290	14.26
12.000	6.419	6.419	0.682	0.682	1.0100	3.83	0.0269	15.10
12.200	7.047	7.047	0.567	0.567	1.0100	3.85	0.0257	15.50

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX A1-07P

FREQUENCY GHz	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	26.546	26.546	3.020	3.020	1.005	4.12	0.0631	9.09
8.400	25.763	25.762	2.795	2.795	1.005	4.18	0.0619	8.98
8.600	24.779	24.778	2.616	2.616	1.005	4.11	0.0605	9.05
8.800	22.491	22.490	2.431	2.431	1.005	4.25	0.0601	8.76
9.000	21.355	21.354	2.278	2.278	1.005	4.27	0.0565	9.09
9.200	19.431	19.430	2.142	2.142	1.005	4.26	0.0550	9.15
9.400	16.730	16.729	2.010	2.010	1.005	4.28	0.0544	9.03
9.600	12.503	12.502	1.899	1.899	1.005	4.24	0.0642	7.52
9.800	11.233	11.232	1.777	1.777	1.005	4.26	0.0582	8.10
10.000	9.550	9.549	1.656	1.656	1.005	4.28	0.0545	8.46
10.200	7.780	7.779	1.537	1.537	1.005	4.29	0.0531	8.51
10.400	5.936	5.935	1.428	1.427	1.005	4.28	0.0570	7.79
10.600	4.457	4.456	1.305	1.305	1.005	4.28	0.0604	7.20
10.800	3.516	3.516	1.172	1.172	1.005	4.28	0.0617	6.93
11.000	3.013	3.013	1.093	1.093	1.005	4.20	0.0672	6.31
11.200	2.901	2.901	0.966	0.966	1.005	4.17	0.0617	6.76
11.400	2.951	2.951	0.828	0.828	1.005	4.16	0.0562	7.31
11.600	3.090	3.090	0.687	0.687	1.005	4.16	0.0534	7.55
11.800	3.548	3.548	0.603	0.603	1.005	4.12	0.0487	8.19
12.000	4.217	4.217	0.497	0.497	1.005	4.12	0.0455	8.61
12.200	5.176	5.177	0.410	0.410	1.005	4.13	0.0426	9.03

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX A1-07PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	42.316	42.317	0.053	0.053	1.010	3.59	0.0348	17.65
8.400	39.902	39.902	0.003	0.003	1.010	3.71	0.0377	15.66
8.600	41.687	41.687	2.681	2.681	1.010	3.65	0.0348	16.71
8.800	41.020	41.019	2.496	2.496	1.010	3.76	0.0344	16.24
9.000	38.371	38.370	2.348	2.348	1.010	3.76	0.0349	15.70
9.200	36.559	36.558	2.217	2.217	1.010	3.74	0.0343	15.64
9.400	34.316	34.315	2.092	2.092	1.010	3.75	0.0336	15.61
9.600	27.102	27.101	1.979	1.979	1.010	3.74	0.0388	13.26
9.800	25.942	25.940	1.862	1.862	1.010	3.80	0.0351	14.26
10.000	22.284	22.282	1.751	1.751	1.010	3.83	0.0346	14.10
10.200	17.721	17.719	1.652	1.652	1.010	3.83	0.0373	12.82
10.400	13.916	13.914	1.563	1.562	1.010	3.80	0.0414	11.38
10.600	10.740	10.739	1.470	1.470	1.010	3.79	0.0455	10.16
10.800	8.531	8.530	1.357	1.357	1.010	3.83	0.0447	10.10
11.000	7.219	7.218	1.278	1.278	1.010	3.78	0.0468	9.54
11.200	6.894	6.893	1.181	1.181	1.010	3.76	0.0414	10.62
11.400	7.219	7.218	1.058	1.058	1.010	3.78	0.0319	13.49
11.600	7.447	7.446	0.952	0.952	1.010	3.77	0.0271	15.61
11.800	7.228	7.228	0.838	0.838	1.010	3.77	0.0253	16.48
12.000	7.499	7.499	0.707	0.707	1.010	3.79	0.0231	17.64
12.200	8.045	8.045	0.587	0.587	1.010	3.82	0.0223	17.97

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX A1-08P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	26.761	26.761	3.032	3.032	1.0075	4.02	0.0616	9.43
8.400	25.615	25.614	2.808	2.808	1.0075	4.07	0.0620	9.10
8.600	25.410	25.410	2.628	2.628	1.0075	4.01	0.0590	9.40
8.800	22.856	22.855	2.448	2.448	1.0075	4.10	0.0606	8.84
9.000	19.498	19.497	2.285	2.285	1.0075	4.20	0.0630	8.22
9.200	18.239	18.238	2.154	2.154	1.0075	4.16	0.0609	8.36
9.400	17.378	17.377	2.027	2.027	1.0075	4.16	0.0557	8.93
9.600	13.320	13.319	1.911	1.911	1.0075	4.15	0.0634	7.71
9.800	11.588	11.587	1.779	1.779	1.0075	4.23	0.0571	8.30
10.000	9.851	9.850	1.649	1.649	1.0075	4.29	0.0514	8.98
10.200	7.762	7.761	1.535	1.535	1.0075	4.28	0.0528	8.57
10.400	6.331	6.330	1.435	1.435	1.0075	4.23	0.0551	8.10
10.600	5.464	5.463	1.303	1.303	1.0075	4.25	0.0495	8.83
10.800	4.831	4.830	1.160	1.160	1.0075	4.26	0.0443	9.66
11.000	4.207	4.207	1.030	1.030	1.0075	4.24	0.0438	9.62
11.200	3.846	3.846	0.884	0.884	1.0075	4.24	0.0429	9.63
11.400	3.890	3.890	0.750	0.750	1.0075	4.23	0.0414	9.83
11.600	4.169	4.169	0.629	0.629	1.0075	4.22	0.0403	9.93
11.800	4.519	4.519	0.541	0.541	1.0075	4.19	0.0402	9.82
12.000	5.146	5.147	0.443	0.442	1.0075	4.20	0.0405	9.57
12.200	6.145	6.146	0.373	0.372	1.0075	4.19	0.0389	9.81

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX A1-08PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	41.257	41.258	0.043	0.043	1.0050	3.68	0.0366	16.58
8.400	37.154	37.154	0.008	0.008	1.0050	3.71	0.0405	14.59
8.600	39.264	39.264	2.681	2.681	1.0050	3.68	0.0372	15.57
8.800	37.714	37.714	2.506	2.506	1.0050	3.73	0.0376	14.92
9.000	32.100	32.100	2.351	2.351	1.0050	3.77	0.0420	12.99
9.200	31.297	31.296	2.217	2.217	1.0050	3.77	0.0403	13.24
9.400	32.322	32.321	2.095	2.095	1.0050	3.77	0.0361	14.51
9.600	23.442	23.441	1.997	1.997	1.0050	3.67	0.0470	11.03
9.800	19.976	19.975	1.872	1.872	1.0050	3.78	0.0472	10.61
10.000	19.976	19.974	1.761	1.761	1.0050	3.83	0.0401	12.17
10.200	17.885	17.883	1.662	1.662	1.0050	3.83	0.0385	12.44
10.400	16.368	16.366	1.576	1.575	1.0050	3.79	0.0371	12.72
10.600	15.293	15.291	1.465	1.465	1.0050	3.83	0.0314	14.65
10.800	14.109	14.107	1.372	1.372	1.0050	3.82	0.0286	15.79
11.000	12.503	12.501	1.273	1.273	1.0050	3.81	0.0267	16.66
11.200	10.268	10.267	1.151	1.151	1.0050	3.85	0.0255	17.01
11.400	8.954	8.953	1.023	1.023	1.0050	3.87	0.0238	17.86
11.600	8.008	8.007	0.917	0.917	1.0050	3.86	0.0238	17.62
11.800	7.096	7.096	0.803	0.803	1.0050	3.85	0.0248	16.61
12.000	7.015	7.015	0.687	0.687	1.0050	3.86	0.0245	16.50
12.200	7.745	7.745	0.582	0.582	1.0050	3.86	0.0231	17.23

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CU A1-C1

FREQUENCY MHz	VSWR MEASURED	VSWR CALCULATED	DEPTH MEASURED CM	DEPTH CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
100.00	100.000	100.000	142.480	142.480	6.325	25.57	0.0000	0.00
150.00	100.000	100.000	92.045	92.045	6.325	15.61	0.0000	0.00
200.00	100.000	100.000	68.243	68.243	6.325	3.44	0.0000	0.00
250.00	100.000	100.000	53.003	53.003	6.325	3.50	0.0000	0.00
300.00	100.000	100.000	42.960	42.960	6.325	2.88	0.0000	0.00
350.00	58.000	57.998	35.475	35.475	6.325	3.01	0.1280	122.96
400.00	58.000	57.998	29.719	29.719	6.325	3.05	0.0772	177.05
450.00	63.000	62.999	25.180	25.180	6.325	2.98	0.0477	257.67
500.00	21.000	20.999	17.784	17.784	6.325	4.67	0.0364	242.83
400.00	45.000	44.998	29.589	29.589	6.325	3.20	0.0916	145.77
450.00	35.000	34.999	25.165	25.165	6.325	3.00	0.0849	144.35
500.00	27.000	26.999	21.435	21.435	6.325	2.93	0.0777	143.73
550.00	19.300	19.299	17.965	17.965	6.325	3.02	0.0717	139.32
600.00	15.800	15.799	15.218	15.218	6.325	2.96	0.0680	136.03
650.00	12.800	12.800	12.715	12.715	6.325	2.94	0.0670	127.91
700.00	11.450	11.450	10.475	10.475	6.325	2.94	0.0633	125.73
750.00	10.300	10.300	8.575	8.575	6.325	2.93	0.0640	116.25
800.00	9.900	9.900	6.845	6.845	6.325	2.96	0.0638	108.64
850.00	10.500	10.500	5.535	5.535	6.325	2.95	0.0611	107.00
900.00	10.400	10.400	4.415	4.415	6.325	2.96	0.0647	95.34
815.00	10.900	10.900	4.145	4.145	6.325	2.96	0.0627	96.72
950.00	10.900	10.900	3.705	3.705	6.325	2.89	0.0647	91.39
1000.00	12.200	12.200	3.185	3.185	6.325	2.79	0.0602	94.96
1100.00	14.500	14.500	2.245	2.245	6.325	2.68	0.0554	95.66
1200.00	15.000	15.000	1.335	1.335	6.325	2.70	0.0607	79.63

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CS A2-01P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.200	9.583	9.583	2.675	2.675	1.795	6.05	0.0656	26.89
2.300	8.502	8.502	1.830	1.830	1.795	6.06	0.0924	18.26
2.400	6.800	6.800	1.540	1.540	1.795	5.78	0.1188	13.94
2.450	8.730	8.730	1.935	1.935	1.795	5.25	0.0695	24.46
2.500	9.784	9.784	1.280	1.280	1.795	5.73	0.0911	17.52
2.600	15.031	15.032	0.970	0.970	1.795	5.85	0.0709	21.43
2.700	19.770	19.770	0.730	0.730	1.795	5.97	0.0630	22.97
2.800	22.490	22.491	0.505	0.505	1.795	6.23	0.0662	20.63
2.900	16.255	16.256	0.350	0.350	1.795	6.36	0.1034	12.64
3.000	12.331	12.331	0.285	0.285	1.795	6.18	0.1388	9.25
3.100	8.511	8.512	0.265	0.265	1.795	5.74	0.1945	6.64
3.200	11.104	11.105	0.275	0.275	1.795	5.47	0.1394	9.17
3.300	14.028	14.028	0.205	0.205	1.795	5.50	0.1144	10.79
3.400	16.255	16.256	0.155	0.155	1.795	5.44	0.0998	12.07
3.500	18.493	18.493	0.095	0.095	1.795	5.45	0.0894	13.08
3.600	25.882	25.882	0.035	0.035	1.795	5.49	0.0645	17.56
3.700	28.757	28.758	4.887	4.887	1.795	5.45	0.0574	19.24
3.800	37.282	37.282	4.607	4.607	1.795	5.73	0.0437	23.99
3.900	39.446	39.445	4.377	4.377	1.795	5.81	0.0391	25.96
4.000	29.326	29.325	4.161	4.161	1.795	5.88	0.0484	20.31

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CS A2-02PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.200	9.441	9.441	1.673	1.673	1.917	6.13	0.1195	14.68
2.300	10.852	10.852	1.418	1.418	1.917	5.97	0.0978	17.38
2.400	11.614	11.615	1.058	1.058	1.917	6.01	0.1042	15.58
2.450	16.330	16.331	0.873	0.873	1.917	6.19	0.0831	18.85
2.500	32.174	32.175	0.788	0.788	1.917	6.20	0.0435	35.27
2.600	18.493	18.493	0.558	0.558	1.917	6.32	0.0868	16.84
2.700	17.824	17.824	0.403	0.403	1.917	6.39	0.0985	14.21
2.800	15.667	15.668	0.253	0.253	1.917	6.56	0.1240	10.75
2.900	13.852	13.852	0.183	0.183	1.917	6.44	0.1418	9.17
3.000	13.788	13.788	0.113	0.113	1.917	6.40	0.1442	8.74
3.100	14.109	14.109	0.043	0.043	1.917	6.42	0.1417	8.59
3.200	11.858	11.858	6.113	6.113	1.917	6.56	0.1712	6.83
3.300	8.730	8.730	0.003	0.003	1.917	5.76	0.2179	5.56
3.400	13.002	13.002	5.543	5.543	1.917	5.73	0.1380	8.51
3.500	16.406	16.406	5.245	5.245	1.917	5.73	0.1054	10.82
3.600	24.803	24.802	4.942	4.942	1.917	5.90	0.0657	16.61
3.700	24.717	24.716	4.675	4.675	1.917	5.96	0.0608	17.39
3.800	21.330	21.329	4.385	4.385	1.917	6.23	0.0593	16.98
3.900	16.827	16.825	4.155	4.155	1.917	6.21	0.0653	15.05
4.000	12.162	12.161	3.929	3.929	1.917	6.23	0.0756	12.65

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX 42-03P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATIO DEPTH CM
8.200	5.420	5.419	2.780	2.780	1.0100	6.21	0.1643	2.85
8.400	4.041	4.040	2.530	2.530	1.0100	6.31	0.1463	3.10
8.600	2.809	2.809	2.346	2.346	1.0100	6.35	0.1531	2.88
8.800	1.995	1.995	2.161	2.161	1.0100	6.39	0.1416	3.04
9.000	1.426	1.426	2.063	2.063	1.0100	6.41	0.1379	3.04
9.200	1.252	1.252	2.312	2.312	1.0100	6.40	0.1464	2.81
9.400	1.406	1.406	0.158	0.158	1.0100	6.31	0.1566	2.59
9.600	1.570	1.570	0.260	0.260	1.0100	6.23	0.1486	2.69
9.800	1.939	1.939	0.278	0.278	1.0100	6.21	0.1422	2.75
10.000	2.239	2.239	0.245	0.245	1.0100	6.13	0.1472	2.62
10.200	2.985	2.985	0.215	0.215	1.0100	6.20	0.1380	2.73
10.400	3.573	3.573	0.170	0.170	1.0100	6.24	0.1439	2.56
10.600	3.664	3.664	0.130	0.130	1.0100	6.18	0.1670	2.18
10.800	3.289	3.289	0.095	0.095	1.0100	5.98	0.2119	1.71
11.000	3.266	3.266	0.130	0.130	1.0100	5.69	0.1758	2.08
11.200	4.004	4.004	0.110	0.110	1.0100	5.76	0.1623	2.19
11.400	4.519	4.519	0.080	0.080	1.0100	5.84	0.1668	2.08
11.600	4.737	4.737	0.065	0.065	1.0100	5.80	0.1686	2.03
11.800	4.887	4.887	0.050	0.050	1.0100	5.76	0.1725	1.96
12.000	4.803	4.803	0.025	0.025	1.0100	5.82	0.1941	1.71
12.200	4.825	4.825	0.005	0.005	1.0100	5.89	0.2049	1.58

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX A2-03PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	28.249	28.246	2.785	2.785	1.0750	5.14	0.0352	14.57
8.400	25.293	25.290	2.560	2.560	1.0750	5.07	0.0323	15.59
8.600	25.177	25.173	2.361	2.361	1.0750	5.00	0.0266	18.67
8.800	20.324	20.321	2.159	2.159	1.0750	5.00	0.0248	19.58
9.000	15.276	15.273	1.958	1.958	1.0750	5.00	0.0241	19.70
9.200	11.259	11.257	1.759	1.759	1.0750	4.98	0.0241	19.28
9.400	6.434	6.433	1.557	1.556	1.0750	4.96	0.0318	14.33
9.600	3.548	3.547	1.359	1.359	1.0750	4.93	0.0464	9.64
9.800	3.228	3.228	1.164	1.164	1.0750	4.88	0.0450	9.79
10.000	3.758	3.758	0.916	0.916	1.0750	4.88	0.0367	11.76
10.200	4.555	4.556	0.673	0.673	1.0750	4.93	0.0347	12.16
10.400	5.058	5.059	0.515	0.515	1.0750	4.94	0.0387	10.67
10.600	5.146	5.147	0.395	0.395	1.0750	4.96	0.0485	8.34
10.800	7.153	7.154	0.313	0.313	1.0750	4.98	0.0436	9.09
11.000	7.998	7.999	0.233	0.233	1.0750	5.04	0.0503	7.68
11.200	9.694	9.695	0.185	0.185	1.0750	5.07	0.0492	7.70
11.400	10.375	10.376	0.130	0.130	1.0750	5.17	0.0566	6.51
11.600	10.447	10.448	0.100	0.100	1.0750	5.18	0.0624	5.80
11.800	13.062	13.063	0.083	0.083	1.0750	5.13	0.0523	6.83
12.000	15.346	15.347	0.045	0.045	1.0750	5.26	0.0498	6.96
12.200	17.398	17.398	0.020	0.020	1.0750	5.31	0.0459	7.40

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX 42-04P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	3.062	3.061	2.507	2.507	1.0050	7.28	0.0881	4.90
8.400	2.399	2.398	2.207	2.207	1.0050	7.14	0.0794	5.35
8.600	1.862	1.862	1.901	1.900	1.0050	7.02	0.0752	5.57
8.800	1.583	1.583	1.581	1.580	1.0050	6.86	0.0733	5.65
9.000	1.660	1.660	1.090	1.090	1.0050	6.80	0.0652	6.24
9.200	2.042	2.042	0.818	0.818	1.0050	6.69	0.0610	6.58
9.400	2.500	2.500	0.643	0.643	1.0050	6.59	0.0608	6.51
9.600	3.162	3.163	0.530	0.530	1.0050	6.49	0.0585	6.68
9.800	3.806	3.807	0.423	0.423	1.0050	6.43	0.0616	6.24
10.000	4.550	4.551	0.350	0.350	1.0050	6.36	0.0629	6.02
10.200	5.297	5.298	0.303	0.303	1.0050	6.26	0.0624	6.00
10.400	6.252	6.253	0.255	0.255	1.0050	6.21	0.0622	5.92
10.600	6.998	6.999	0.215	0.215	1.0050	6.15	0.0641	5.66
10.800	7.843	7.844	0.195	0.195	1.0050	6.04	0.0612	5.88
11.000	8.831	8.832	0.168	0.168	1.0050	5.97	0.0600	5.92
11.200	9.616	9.617	0.140	0.140	1.0050	5.94	0.0613	5.70
11.400	10.139	10.140	0.115	0.115	1.0050	5.91	0.0639	5.39
11.600	10.864	10.865	0.095	0.095	1.0050	5.86	0.0639	5.32
11.800	11.926	11.927	0.080	0.080	1.0050	5.80	0.0609	5.52
12.000	12.134	12.134	0.048	0.048	1.0050	5.90	0.0667	4.92
12.200	12.417	12.417	0.035	0.035	1.0050	5.84	0.0666	4.87

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX 42-04PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	29.107	29.104	2.865	2.865	1.0050	5.34	0.0471	10.69
8.400	25.264	25.261	2.637	2.637	1.0050	5.36	0.0444	11.05
8.600	22.208	22.205	2.441	2.441	1.0050	5.33	0.0415	11.58
8.800	18.155	18.152	2.236	2.236	1.0050	5.42	0.0367	12.71
9.000	14.158	14.156	2.048	2.048	1.0050	5.44	0.0345	13.19
9.200	10.977	10.975	1.859	1.859	1.0050	5.46	0.0319	13.93
9.400	7.700	7.698	1.657	1.656	1.0050	5.47	0.0320	13.58
9.500	5.578	5.577	1.444	1.444	1.0050	5.47	0.0324	13.11
9.800	4.472	4.472	1.204	1.204	1.0050	5.47	0.0319	13.05
10.000	4.130	4.130	0.960	0.960	1.0050	5.47	0.0317	12.86
10.200	4.519	4.519	0.758	0.758	1.0050	5.46	0.0311	12.89
10.400	5.689	5.690	0.595	0.595	1.0050	5.44	0.0292	13.49
10.600	7.079	7.080	0.465	0.465	1.0050	5.45	0.0293	13.18
10.800	8.443	8.444	0.375	0.375	1.0050	5.43	0.0302	12.55
11.000	9.419	9.420	0.305	0.305	1.0050	5.42	0.0330	11.31
11.200	10.350	10.351	0.263	0.263	1.0050	5.36	0.0341	10.78
11.400	11.980	11.981	0.205	0.205	1.0050	5.41	0.0363	9.93
11.600	12.370	12.371	0.175	0.175	1.0050	5.36	0.0391	9.09
11.800	15.080	15.081	0.150	0.150	1.0050	5.32	0.0351	9.99
12.000	17.040	17.041	0.115	0.115	1.0050	5.36	0.0356	9.64
12.200	20.860	20.861	0.088	0.088	1.0050	5.39	0.0321	10.50

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX A2-05D

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	1.567	1.567	2.725	2.725	1.0050	7.82	0.1258	3.32
8.400	1.329	1.329	2.645	2.645	1.0050	7.61	0.1227	3.36
8.600	1.161	1.161	0.040	0.041	1.0050	7.39	0.1147	3.57
8.800	1.225	1.225	0.378	0.378	1.0050	7.19	0.1124	3.60
9.000	1.380	1.380	0.450	0.450	1.0050	6.99	0.1114	3.61
9.200	1.549	1.549	0.453	0.453	1.0050	6.79	0.1102	3.62
9.400	1.820	1.820	0.433	0.433	1.0050	6.64	0.1068	3.69
9.600	2.080	2.080	0.440	0.440	1.0050	6.45	0.0977	4.01
9.800	2.399	2.399	0.378	0.378	1.0050	6.34	0.1004	3.86
10.000	2.786	2.786	0.335	0.335	1.0050	6.23	0.0996	3.84
10.200	3.412	3.413	0.303	0.303	1.0050	6.14	0.0921	4.10
10.400	4.036	4.037	0.265	0.265	1.0050	6.07	0.0893	4.17
10.600	4.426	4.427	0.240	0.240	1.0050	5.95	0.0887	4.16
10.800	4.477	4.478	0.200	0.200	1.0050	5.88	0.1011	3.61
11.000	4.814	4.815	0.190	0.190	1.0050	5.74	0.0969	3.74
11.200	5.559	5.560	0.175	0.175	1.0050	5.65	0.0888	4.04
11.400	6.124	6.125	0.140	0.140	1.0050	5.66	0.0930	3.79
11.600	6.479	6.480	0.128	0.128	1.0050	5.55	0.0912	3.83
11.800	7.244	7.245	0.118	0.118	1.0050	5.45	0.0840	4.13
12.000	7.980	7.981	0.090	0.090	1.0050	5.48	0.0851	4.00
12.200	8.472	8.472	0.065	0.065	1.0050	5.51	0.0876	3.81

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX 42-05PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	29.580	29.577	2.860	2.860	1.0100	5.33	0.0454	11.10
8.400	25.734	25.731	2.630	2.630	1.0100	5.35	0.0424	11.59
8.600	22.310	22.307	2.436	2.436	1.0100	5.31	0.0405	11.91
8.800	17.199	17.196	2.221	2.221	1.0100	5.43	0.0364	12.80
9.000	12.531	12.529	2.023	2.023	1.0100	5.47	0.0354	12.81
9.200	8.443	8.441	1.832	1.832	1.0100	5.48	0.0378	11.73
9.400	5.099	5.098	1.637	1.636	1.0100	5.48	0.0453	9.58
9.600	4.135	4.134	1.439	1.439	1.0100	5.44	0.0431	9.89
9.800	3.188	3.188	1.219	1.219	1.0100	5.42	0.0455	9.21
10.000	3.548	3.548	0.976	0.976	1.0100	5.41	0.0372	11.03
10.200	4.102	4.102	0.748	0.748	1.0100	5.42	0.0346	11.62
10.400	4.937	4.938	0.560	0.560	1.0100	5.44	0.0354	11.10
10.600	5.414	5.415	0.410	0.410	1.0100	5.49	0.0433	8.87
10.800	4.715	4.716	0.340	0.340	1.0100	5.43	0.0589	6.44
11.000	3.936	3.937	0.290	0.290	1.0100	5.32	0.0801	4.70
11.200	4.989	4.990	0.290	0.290	1.0100	5.17	0.0633	5.92
11.400	8.260	8.261	0.240	0.240	1.0100	5.20	0.0456	8.06
11.600	12.218	12.219	0.200	0.200	1.0100	5.20	0.0356	10.14
11.800	15.631	15.633	0.163	0.163	1.0100	5.21	0.0320	11.09
12.000	17.458	17.459	0.120	0.120	1.0100	5.28	0.0339	10.20
12.200	20.230	20.231	0.090	0.090	1.0100	5.32	0.0327	10.37

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX A2-07P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	15.977	15.975	2.780	2.780	1.0100	5.89	0.0609	7.87
8.400	15.542	15.539	2.532	2.532	1.0100	5.91	0.0460	10.15
8.600	13.583	13.581	2.336	2.336	1.0100	5.80	0.0431	10.69
8.800	10.593	10.591	2.116	2.116	1.0100	5.81	0.0386	11.64
9.000	7.825	7.823	1.913	1.913	1.0100	5.78	0.0383	11.51
9.200	5.617	5.616	1.712	1.712	1.0100	5.73	0.0399	10.86
9.400	3.467	3.466	1.447	1.446	1.0100	5.76	0.0451	9.39
9.600	1.600	1.600	1.145	1.145	1.0100	5.80	0.0792	5.21
9.800	1.462	1.462	1.502	1.502	1.0100	5.36	0.1242	3.39
10.000	2.213	2.213	1.046	1.046	1.0100	5.34	0.0614	6.73
10.200	2.844	2.844	0.695	0.695	1.0100	5.46	0.0518	7.72
10.400	3.467	3.468	0.470	0.470	1.0100	5.55	0.0586	6.65
10.600	4.477	4.478	0.350	0.350	1.0100	5.61	0.0609	6.24
10.800	5.389	5.390	0.248	0.248	1.0100	5.71	0.0706	5.24
11.000	5.970	5.971	0.170	0.170	1.0100	5.84	0.0866	4.15
11.200	6.457	6.458	0.120	0.120	1.0100	5.94	0.0993	3.53
11.400	6.067	6.067	0.050	0.050	1.0100	6.27	0.1445	2.31
11.600	4.989	4.989	0.033	0.033	1.0100	6.13	0.1888	1.77
11.800	4.694	4.694	0.045	0.045	1.0100	5.78	0.1846	1.83
12.000	6.800	6.800	0.013	0.013	1.0100	6.14	0.1370	2.35
12.200	7.413	7.413	1.452	1.452	1.0100	6.19	0.1260	2.50

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX A2-07PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	35.481	35.478	2.863	2.863	1.0070	5.34	0.0383	13.16
8.400	30.409	30.406	2.618	2.618	1.0070	5.46	0.0342	14.23
8.600	25.177	25.174	2.419	2.419	1.0070	5.43	0.0334	14.28
8.800	19.724	19.721	2.199	2.199	1.0070	5.55	0.0289	15.91
9.000	14.757	14.754	1.996	1.996	1.0070	5.58	0.0272	16.50
9.200	10.740	10.738	1.795	1.795	1.0070	5.58	0.0266	16.81
9.400	6.902	6.901	1.559	1.558	1.0070	5.62	0.0282	15.20
9.600	4.107	4.106	1.310	1.310	1.0070	5.63	0.0357	11.76
9.800	2.884	2.884	1.072	1.072	1.0070	5.60	0.0450	9.15
10.000	3.055	3.055	0.843	0.843	1.0070	5.57	0.0435	9.30
10.200	3.428	3.428	0.636	0.636	1.0070	5.57	0.0457	8.68
10.400	3.803	3.803	0.493	0.493	1.0070	5.56	0.0512	7.60
10.600	3.618	3.619	0.383	0.383	1.0070	5.53	0.0678	5.65
10.800	3.177	3.177	0.373	0.373	1.0070	5.32	0.0775	4.95
11.000	5.636	5.637	0.353	0.353	1.0070	5.24	0.0471	8.05
11.200	10.471	10.472	0.278	0.278	1.0070	5.29	0.0320	11.58
11.400	14.207	14.209	0.223	0.223	1.0070	5.32	0.0285	12.75
11.600	16.144	16.146	0.178	0.178	1.0070	5.34	0.0296	12.02
11.800	21.429	21.431	0.148	0.148	1.0070	5.32	0.0249	14.05
12.000	24.266	24.268	0.113	0.113	1.0070	5.37	0.0252	13.61
12.200	29.923	29.925	0.073	0.073	1.0070	5.49	0.0238	14.03

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX 42-10P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	8.851	8.851	2.957	2.957	1.0100	4.51	0.2032	2.71
8.400	8.017	8.017	2.745	2.745	1.0100	4.50	0.2062	2.61
8.600	7.039	7.039	2.569	2.569	1.0100	4.44	0.2183	2.43
8.800	5.794	5.794	2.396	2.396	1.0100	4.57	0.2317	2.21
9.000	4.989	4.989	2.258	2.258	1.0100	4.54	0.2431	2.06
9.200	4.360	4.360	2.127	2.127	1.0100	4.57	0.2376	2.06
9.400	3.715	3.715	2.006	2.006	1.0100	4.62	0.2302	2.07
9.600	3.090	3.090	1.924	1.924	1.0100	4.58	0.2601	1.80
9.800	2.692	2.692	1.799	1.799	1.0100	4.63	0.2170	2.10
10.000	2.239	2.239	1.691	1.691	1.0100	4.66	0.1973	2.25
10.200	1.847	1.847	1.577	1.577	1.0100	4.68	0.1769	2.46
10.400	1.424	1.424	1.443	1.442	1.0100	4.73	0.1581	2.68
10.600	1.113	1.113	1.040	1.040	1.0100	4.79	0.1381	2.99
10.800	1.352	1.352	0.518	0.518	1.0100	4.84	0.1260	3.19
11.000	1.780	1.780	0.380	0.380	1.0100	4.89	0.1229	3.20
11.200	2.291	2.291	0.318	0.318	1.0100	4.91	0.1161	3.32
11.400	2.723	2.723	0.250	0.250	1.0100	4.93	0.1223	3.09
11.600	3.170	3.170	0.225	0.225	1.0100	4.89	0.1163	3.20
11.800	3.793	3.793	0.200	0.200	1.0100	4.87	0.1078	3.41
12.000	4.236	4.236	0.105	0.105	1.0100	5.14	0.1465	2.40
12.200	4.350	4.350	0.130	0.130	1.0100	4.87	0.1245	2.85

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX 42-10PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	27.861	27.858	2.940	2.840	1.0100	5.47	0.0449	11.09
8.400	23.632	23.629	2.612	2.612	1.0100	5.47	0.0429	11.34
8.600	20.230	20.227	2.416	2.416	1.0100	5.42	0.0410	11.65
8.800	15.959	15.956	2.196	2.196	1.0100	5.53	0.0353	13.06
9.000	11.416	11.414	1.993	1.993	1.0100	5.57	0.0347	12.96
9.200	9.215	9.213	1.799	1.799	1.0100	5.55	0.0313	14.06
9.400	6.434	6.433	1.582	1.581	1.0100	5.55	0.0318	13.54
9.600	4.759	4.758	1.354	1.354	1.0100	5.54	0.0328	12.88
9.800	3.981	3.981	1.104	1.104	1.0100	5.53	0.0332	12.47
10.000	4.074	4.074	0.870	0.870	1.0100	5.52	0.0324	12.54
10.200	4.651	4.652	0.678	0.678	1.0100	5.51	0.0323	12.34
10.400	5.358	5.359	0.530	0.530	1.0100	5.49	0.0343	11.40
10.600	6.223	6.224	0.435	0.435	1.0100	5.45	0.0356	10.83
10.800	7.482	7.483	0.358	0.358	1.0100	5.42	0.0358	10.61
11.000	9.141	9.142	0.298	0.298	1.0100	5.39	0.0348	10.74
11.200	10.617	10.618	0.245	0.245	1.0100	5.38	0.0356	10.32
11.400	11.817	11.818	0.195	0.195	1.0100	5.40	0.0383	9.40
11.600	13.397	13.398	0.165	0.165	1.0100	5.37	0.0377	9.42
11.800	17.041	17.043	0.140	0.140	1.0100	5.34	0.0325	10.79
12.000	19.476	19.477	0.110	0.110	1.0100	5.35	0.0318	10.81
12.200	22.803	22.804	0.080	0.080	1.0100	5.40	0.0303	11.12

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX A2-11P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	1.845	1.845	3.016	3.016	1.0090	8.04	0.1671	2.46
8.400	1.732	1.732	0.064	0.064	1.0090	7.83	0.1595	2.55
8.600	1.702	1.702	0.191	0.191	1.0090	7.65	0.1456	2.76
8.800	1.841	1.841	0.271	0.271	1.0090	7.48	0.1367	2.91
9.000	2.188	2.188	0.306	0.306	1.0090	7.36	0.1267	3.09
9.200	2.802	2.802	0.301	0.301	1.0090	7.30	0.1147	3.35
9.400	3.577	3.578	0.254	0.254	1.0090	7.27	0.1126	3.39
9.600	4.178	4.179	0.219	0.219	1.0090	7.19	0.1124	3.39
9.800	4.732	4.733	0.174	0.174	1.0090	7.17	0.1207	3.02
10.000	5.200	5.200	0.136	0.136	1.0090	7.15	0.1304	2.74
10.200	5.754	5.754	0.114	0.114	1.0090	7.10	0.1296	2.72
10.400	6.033	6.033	0.086	0.086	1.0090	7.09	0.1395	2.48
10.600	5.708	5.708	0.071	0.071	1.0090	6.93	0.1548	2.21
10.800	5.695	5.695	0.051	0.051	1.0090	6.89	0.1676	2.02
11.000	5.735	5.735	0.049	0.049	1.0090	6.69	0.1633	2.06
11.200	6.033	6.033	0.036	0.036	1.0090	6.65	0.1602	2.07
11.400	6.046	6.046	0.006	0.006	1.0090	6.83	0.1749	1.84
11.600	6.005	6.005	0.004	0.004	1.0090	6.64	0.1720	1.86
11.800	6.131	6.131	0.001	0.001	1.0090	6.48	0.1642	1.94
12.000	6.310	6.310	1.473	1.473	1.0090	6.59	0.1586	1.98
12.200	6.660	6.660	1.418	1.418	1.0090	6.70	0.1414	2.14

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CX A2-11PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	29.141	29.139	2.860	2.860	1.0100	5.33	0.0461	10.93
8.400	24.946	24.943	2.615	2.615	1.0100	5.45	0.0411	11.84
8.600	21.062	21.059	2.406	2.406	1.0100	5.47	0.0377	12.59
8.800	14.757	14.755	2.184	2.184	1.0100	5.58	0.0363	12.65
9.000	10.435	10.433	1.983	1.983	1.0100	5.60	0.0365	12.27
9.200	8.308	8.306	1.782	1.782	1.0100	5.59	0.0330	13.31
9.400	5.445	5.444	1.542	1.541	1.0100	5.62	0.0344	12.46
9.600	3.258	3.258	1.284	1.284	1.0100	5.63	0.0435	9.62
9.800	2.692	2.692	1.060	1.060	1.0100	5.58	0.0481	8.57
10.000	3.073	3.073	0.830	0.830	1.0100	5.56	0.0435	9.31
10.200	3.471	3.472	0.613	0.613	1.0100	5.57	0.0465	8.52
10.400	3.686	3.687	0.490	0.490	1.0100	5.53	0.0532	7.34
10.600	3.806	3.807	0.390	0.390	1.0100	5.50	0.0637	6.03
10.800	4.683	4.684	0.370	0.370	1.0100	5.36	0.0545	7.01
11.000	6.745	6.746	0.300	0.300	1.0100	5.37	0.0465	8.05
11.200	8.299	8.300	0.245	0.245	1.0100	5.37	0.0453	8.11
11.400	8.185	8.186	0.190	0.190	1.0100	5.40	0.0562	6.41
11.600	9.183	9.184	0.170	0.170	1.0100	5.32	0.0536	6.66
11.800	12.274	12.275	0.153	0.153	1.0100	5.25	0.0425	8.31
12.000	16.444	16.445	0.110	0.110	1.0100	5.35	0.0377	9.13
12.200	21.184	21.185	0.083	0.083	1.0100	5.38	0.0322	10.48

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. CU A2-C1

FREQUENCY MHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
100.00	100.000	100.000	145.465	145.465	4.420	2.18	0.0000	0.00
150.00	100.000	100.000	95.465	95.465	4.420	2.69	0.0000	0.00
200.00	100.000	100.000	70.398	70.398	4.420	3.54	0.0000	0.00
250.00	100.000	100.000	55.268	55.268	4.420	4.24	0.0000	0.00
300.00	100.000	100.000	45.255	45.255	4.420	3.42	0.0000	0.00
350.00	32.400	32.399	37.920	37.920	4.420	4.06	0.5303	26.33
400.00	84.000	83.998	32.474	32.474	4.420	3.58	0.1517	83.35
450.00	100.000	100.000	28.120	28.120	4.420	3.60	0.0000	0.00
500.00	100.000	100.000	24.649	24.649	4.420	3.44	0.0000	0.00
400.00	57.000	56.998	31.094	31.094	4.420	7.62	0.0616	140.35
450.00	49.000	48.999	28.130	28.130	4.420	3.60	0.1695	66.20
500.00	79.000	78.999	24.710	24.710	4.420	3.31	0.0813	129.02
550.00	100.000	100.000	21.520	21.520	4.420	3.72	0.0000	0.00
600.00	90.000	89.997	19.133	19.133	4.420	3.47	0.0328	260.19
650.00	72.000	71.997	16.971	16.971	4.420	3.40	0.0312	235.35
700.00	44.000	43.998	14.880	14.880	4.420	3.49	0.0361	202.37
750.00	52.000	51.998	13.050	13.050	4.420	3.50	0.0233	291.77
800.00	50.000	49.998	11.340	11.340	4.420	3.52	0.0190	334.51
850.00	47.000	46.998	9.780	9.780	4.420	3.53	0.0167	358.47
900.00	44.000	43.999	8.350	8.350	4.420	3.54	0.0154	365.40
915.00	40.000	39.999	8.010	8.010	4.420	3.52	0.0166	335.11
950.00	35.000	34.999	7.140	7.140	4.420	3.52	0.0179	299.39
1000.00	30.000	30.000	6.240	6.240	4.420	3.43	0.0204	253.18
1100.00	28.000	28.000	4.660	4.660	4.420	3.33	0.0218	217.86
1200.00	17.200	17.200	3.270	3.270	4.420	3.36	0.0385	112.72

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A3-01P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	37.975	37.976	0.038	0.038	1.0050	3.71	0.0401	15.06
8.400	34.994	34.995	0.008	0.008	1.0050	3.71	0.0430	13.74
8.600	36.099	36.099	2.676	2.676	1.0050	3.71	0.0407	14.18
8.800	35.563	35.563	2.496	2.496	1.0050	3.80	0.0400	13.92
9.000	31.441	31.441	2.343	2.343	1.0050	3.83	0.0427	12.70
9.200	29.410	29.409	2.207	2.207	1.0050	3.84	0.0424	12.50
9.400	24.889	24.897	2.080	2.080	1.0050	3.86	0.0454	11.37
9.600	20.464	20.463	1.979	1.979	1.0050	3.78	0.0516	9.90
9.800	18.836	18.835	1.862	1.862	1.0050	3.84	0.0485	10.26
10.000	18.685	18.683	1.746	1.746	1.0050	3.90	0.0405	11.95
10.200	15.867	15.865	1.632	1.632	1.0050	3.95	0.0384	12.26
10.400	11.482	11.480	1.533	1.532	1.0050	3.95	0.0443	10.42
10.600	7.039	7.038	1.415	1.415	1.0050	4.00	0.0557	8.08
10.800	4.004	4.003	1.342	1.342	1.0050	3.96	0.0872	5.10
11.000	4.436	4.436	1.326	1.326	1.0050	3.74	0.0880	5.11
11.200	6.138	6.137	1.206	1.206	1.0050	3.75	0.0498	8.84
11.400	6.745	6.744	1.068	1.068	1.0050	3.80	0.0348	12.35
11.600	6.784	6.784	0.947	0.947	1.0050	3.81	0.0294	14.33
11.800	6.592	6.591	0.833	0.833	1.0050	3.81	0.0275	15.09
12.000	6.554	6.554	0.690	0.690	1.0050	3.85	0.0263	15.42
12.200	6.982	6.983	0.582	0.582	1.0050	3.86	0.0256	15.53

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A3-01PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATIO DEPTH CM
8.200	35.810	35.810	0.032	0.032	1.0110	3.71	0.0427	14.15
8.400	31.333	31.333	0.002	0.002	1.0110	3.71	0.0480	12.29
8.600	33.962	33.962	2.673	2.673	1.0110	3.69	0.0430	13.44
8.800	34.794	34.793	2.495	2.495	1.0110	3.76	0.0406	13.78
9.000	28.576	28.575	2.335	2.335	1.0110	3.84	0.0464	11.68
9.200	27.893	27.892	2.211	2.211	1.0110	3.77	0.0447	11.97
9.400	27.765	27.764	2.079	2.079	1.0110	3.82	0.0404	12.86
9.600	20.464	20.463	1.963	1.963	1.0110	3.83	0.0492	10.34
9.800	15.867	15.866	1.856	1.856	1.0110	3.82	0.0563	8.85
10.000	12.134	12.133	1.748	1.748	1.0110	3.85	0.0628	7.75
10.200	12.897	12.896	1.661	1.661	1.0110	3.79	0.0531	9.09
10.400	13.646	13.644	1.562	1.561	1.0110	3.80	0.0420	11.20
10.600	12.134	12.132	1.459	1.459	1.0110	3.81	0.0387	11.93
10.800	9.694	9.693	1.346	1.346	1.0110	3.85	0.0380	11.87
11.000	6.494	6.493	1.227	1.227	1.0110	3.88	0.0443	9.95
11.200	4.360	4.360	1.135	1.135	1.0110	3.86	0.0572	7.59
11.400	4.508	4.508	1.042	1.042	1.0110	3.81	0.0491	8.73
11.600	5.058	5.058	0.931	0.931	1.0110	3.80	0.0386	10.94
11.800	4.825	4.825	0.817	0.817	1.0110	3.79	0.0371	11.18
12.000	5.389	5.389	0.696	0.696	1.0110	3.80	0.0322	12.68
12.200	6.252	6.252	0.586	0.586	1.0110	3.81	0.0287	13.95

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A3-02P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	26.363	26.363	3.007	3.007	1.0075	4.19	0.0639	8.90
8.400	25.177	25.176	2.783	2.783	1.0075	4.25	0.0630	8.74
8.600	25.119	25.118	2.608	2.608	1.0075	4.15	0.0592	9.20
8.800	24.746	24.744	2.418	2.418	1.0075	4.32	0.0531	9.84
9.000	20.230	20.229	2.265	2.265	1.0075	4.33	0.0575	8.87
9.200	18.923	18.922	2.124	2.124	1.0075	4.34	0.0531	9.37
9.400	15.014	15.012	1.974	1.974	1.0075	4.45	0.0526	9.16
9.600	10.000	9.999	1.876	1.876	1.0075	4.33	0.0731	6.54
9.800	8.035	8.034	1.744	1.744	1.0075	4.39	0.0706	6.59
10.000	7.852	7.851	1.624	1.624	1.0075	4.38	0.0580	7.86
10.200	6.622	6.621	1.500	1.500	1.0075	4.38	0.0542	8.24
10.400	4.715	4.714	1.380	1.380	1.0075	4.37	0.0611	7.18
10.600	3.935	3.935	1.233	1.233	1.0075	4.39	0.0568	7.57
10.800	3.055	3.055	1.103	1.103	1.0075	4.37	0.0620	6.82
11.000	2.754	2.754	0.953	0.953	1.0075	4.36	0.0606	6.87
11.200	2.512	2.512	0.824	0.824	1.0075	4.32	0.0636	6.45
11.400	2.884	2.884	0.695	0.695	1.0075	4.30	0.0561	7.20
11.600	3.815	3.815	0.567	0.567	1.0075	4.31	0.0461	8.60
11.800	4.842	4.842	0.463	0.462	1.0075	4.32	0.0417	9.34
12.000	5.855	5.855	0.373	0.372	1.0075	4.34	0.0411	9.29
12.200	7.015	7.015	0.303	0.302	1.0075	4.36	0.0410	9.15

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A3-02PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	36.391	36.392	3.044	3.044	1.0060	3.95	0.0447	13.10
8.400	32.546	32.546	2.814	2.814	1.0060	4.04	0.0486	11.54
8.600	29.682	29.681	2.585	2.585	1.0060	4.34	0.0489	10.91
8.800	33.419	33.418	2.455	2.455	1.0060	4.07	0.0417	12.90
9.000	30.725	30.724	2.292	2.292	1.0060	4.16	0.0405	12.85
9.200	26.761	26.759	2.156	2.156	1.0060	4.16	0.0416	12.24
9.400	19.999	19.997	2.019	2.019	1.0060	4.22	0.0470	10.52
9.600	14.289	14.288	1.918	1.918	1.0060	4.12	0.0606	8.09
9.800	12.882	12.881	1.806	1.806	1.0060	4.12	0.0573	8.37
10.000	12.517	12.515	1.680	1.680	1.0060	4.18	0.0461	10.13
10.200	10.752	10.751	1.571	1.571	1.0060	4.17	0.0441	10.39
10.400	7.718	7.717	1.462	1.461	1.0060	4.17	0.0499	9.02
10.600	5.495	5.495	1.354	1.354	1.0060	4.16	0.0574	7.70
10.800	4.608	4.607	1.256	1.256	1.0060	4.11	0.0586	7.43
11.000	4.390	4.390	1.160	1.160	1.0060	4.06	0.0539	7.98
11.200	4.281	4.280	1.040	1.040	1.0060	4.04	0.0472	8.97
11.400	4.677	4.677	0.912	0.912	1.0060	4.04	0.0382	10.92
11.600	5.656	5.656	0.781	0.781	1.0060	4.04	0.0296	13.85
11.800	6.607	6.607	0.662	0.662	1.0060	4.04	0.0255	15.78
12.000	7.379	7.380	0.541	0.541	1.0060	4.06	0.0248	15.92
12.200	8.710	8.710	0.444	0.444	1.0060	4.07	0.0239	16.22

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 43-03P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATIC DEPTH CM
8.200	35.810	35.809	3.025	3.025	1.0000	4.13	0.0468	12.26
8.400	33.113	33.112	2.795	2.795	1.0000	4.22	0.0483	11.44
8.600	32.809	32.809	2.626	2.626	1.0000	4.08	0.0460	11.94
8.800	30.199	30.198	2.441	2.441	1.0000	4.22	0.0456	11.58
9.000	27.479	27.477	2.288	2.288	1.0000	4.24	0.0451	11.43
9.200	24.660	24.659	2.157	2.157	1.0000	4.20	0.0454	11.14
9.400	21.503	21.501	2.025	2.025	1.0000	4.24	0.0447	11.03
9.600	17.041	17.039	1.909	1.909	1.0000	4.22	0.0491	9.86
9.800	14.223	14.222	1.792	1.792	1.0000	4.23	0.0490	9.66
10.000	12.416	12.415	1.666	1.666	1.0000	4.28	0.0438	10.54
10.200	10.198	10.196	1.552	1.552	1.0000	4.28	0.0430	10.51
10.400	7.861	7.860	1.423	1.422	1.0000	4.31	0.0426	10.38
10.600	6.046	6.045	1.290	1.290	1.0000	4.33	0.0431	10.05
10.800	4.477	4.477	1.137	1.137	1.0000	4.36	0.0453	9.35
11.000	3.319	3.319	0.988	0.988	1.0000	4.37	0.0519	8.00
11.200	2.723	2.723	0.851	0.851	1.0000	4.35	0.0590	6.92
11.400	2.951	2.951	0.716	0.716	1.0000	4.33	0.0543	7.40
11.600	3.728	3.728	0.612	0.612	1.0000	4.30	0.0453	8.75
11.800	4.836	4.837	0.515	0.515	1.0000	4.29	0.0385	10.14
12.000	6.152	6.153	0.380	0.380	1.0000	4.38	0.0383	9.91
12.200	7.595	7.595	0.330	0.330	1.0000	4.35	0.0380	10.73

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A3-03PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATIO DEPTH CM
8.200	37.714	37.713	3.045	3.045	1.0050	3.96	0.0431	13.58
8.400	32.100	32.099	2.824	2.824	1.0050	3.97	0.0491	11.62
8.600	37.497	37.497	2.656	2.656	1.0050	3.84	0.0397	14.25
8.800	38.150	38.149	2.471	2.471	1.0050	3.97	0.0370	14.71
9.000	33.075	33.074	2.318	2.318	1.0050	3.99	0.0395	13.45
9.200	31.550	31.549	2.182	2.182	1.0050	4.00	0.0377	13.77
9.400	26.915	26.914	2.055	2.055	1.0050	4.02	0.0393	12.89
9.600	20.606	20.605	1.954	1.954	1.0050	3.93	0.0476	10.53
9.800	20.068	20.066	1.832	1.832	1.0050	3.99	0.0408	11.95
10.000	18.535	18.533	1.711	1.711	1.0050	4.05	0.0354	13.38
10.200	16.788	16.786	1.607	1.607	1.0050	4.05	0.0328	14.20
10.400	14.109	14.107	1.498	1.497	1.0050	4.06	0.0315	14.48
10.600	11.130	11.128	1.385	1.385	1.0050	4.06	0.0319	13.99
10.800	8.222	8.221	1.262	1.262	1.0050	4.09	0.0339	12.89
11.000	5.828	5.827	1.056	1.056	1.0050	4.22	0.0330	12.81
11.200	4.169	4.168	1.009	1.009	1.0050	4.10	0.0459	9.17
11.400	3.508	3.507	0.898	0.898	1.0050	4.07	0.0500	8.30
11.600	4.027	4.027	0.817	0.817	1.0050	4.00	0.0425	9.69
11.800	5.152	5.152	0.693	0.693	1.0050	4.00	0.0327	12.39
12.000	6.397	6.398	0.562	0.562	1.0050	4.03	0.0281	14.12
12.200	7.586	7.586	0.455	0.455	1.0050	4.06	0.0269	14.41

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 43-06P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	26.242	26.242	3.035	3.035	1.0000	4.05	0.0633	9.14
8.400	24.210	24.210	2.795	2.795	1.0000	4.21	0.0664	8.34
8.600	23.254	23.254	2.626	2.626	1.0000	4.08	0.0652	8.44
8.800	21.503	21.502	2.441	2.441	1.0000	4.22	0.0643	8.21
9.000	19.231	19.230	2.283	2.283	1.0000	4.28	0.0639	8.03
9.200	18.155	18.154	2.152	2.152	1.0000	4.24	0.0610	8.27
9.400	15.776	15.775	2.015	2.015	1.0000	4.30	0.0588	8.32
9.600	11.708	11.707	1.914	1.914	1.0000	4.20	0.0729	6.65
9.800	9.441	9.439	1.777	1.777	1.0000	4.32	0.0691	6.79
10.000	7.962	7.960	1.646	1.646	1.0000	4.37	0.0624	7.32
10.200	4.667	4.666	1.547	1.547	1.0000	4.36	0.0890	5.04
10.400	4.256	4.255	1.503	1.502	1.0000	4.17	0.1015	4.43
10.600	4.742	4.742	1.380	1.380	1.0000	4.16	0.0715	6.17
10.800	3.855	3.854	1.267	1.267	1.0000	4.16	0.0712	6.09
11.000	3.841	3.841	1.173	1.173	1.0000	4.10	0.0629	6.82
11.200	3.819	3.819	1.031	1.031	1.0000	4.11	0.0517	8.13
11.400	3.846	3.846	0.878	0.878	1.0000	4.13	0.0445	9.25
11.600	3.954	3.954	0.737	0.737	1.0000	4.14	0.0416	9.73
11.800	4.227	4.227	0.618	0.618	1.0000	4.14	0.0404	9.85
12.000	4.608	4.608	0.497	0.497	1.0000	4.15	0.0415	9.39
12.200	5.297	5.297	0.410	0.410	1.0000	4.17	0.0415	9.22

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A3-06PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	30.444	30.444	0.032	0.032	1.0060	3.73	0.0506	11.91
8.400	27.008	27.008	2.844	2.844	1.0060	3.83	0.0572	10.15
8.600	27.925	27.925	2.675	2.675	1.0060	3.71	0.0526	10.96
8.800	29.923	29.922	2.490	2.490	1.0060	3.83	0.0475	11.66
9.000	26.977	26.976	2.337	2.337	1.0060	3.86	0.0495	10.90
9.200	26.946	26.945	2.201	2.201	1.0060	3.87	0.0458	11.52
9.400	25.293	25.292	2.079	2.079	1.0060	3.86	0.0446	11.60
9.600	21.677	21.676	1.973	1.973	1.0060	3.81	0.0479	10.64
9.800	19.588	19.587	1.856	1.856	1.0060	3.86	0.0456	10.87
10.000	20.654	20.652	1.735	1.735	1.0060	3.94	0.0350	13.72
10.200	19.055	19.052	1.631	1.631	1.0060	3.94	0.0319	14.79
10.400	16.330	16.329	1.527	1.526	1.0060	3.92	0.0318	14.60
10.600	13.740	13.738	1.424	1.424	1.0060	3.95	0.0298	15.18
10.800	10.617	10.615	1.321	1.321	1.0060	3.94	0.0317	14.02
11.000	9.183	9.182	1.212	1.212	1.0060	3.94	0.0300	14.57
11.200	7.328	7.327	1.100	1.100	1.0060	3.94	0.0314	13.66
11.400	6.531	6.531	0.977	0.977	1.0060	3.94	0.0300	14.06
11.600	6.434	6.434	0.871	0.871	1.0060	3.92	0.0279	14.89
11.800	6.457	6.456	0.752	0.752	1.0060	3.91	0.0264	15.47
12.000	6.645	6.645	0.636	0.636	1.0060	3.92	0.0260	15.45
12.200	7.219	7.220	0.531	0.531	1.0060	3.93	0.0258	15.32

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A3-08P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	28.022	28.022	0.009	0.009	1.0040	3.88	0.0573	10.31
8.400	26.485	26.485	2.826	2.826	1.0040	3.96	0.0596	9.59
8.600	26.853	26.853	2.652	2.652	1.0040	3.87	0.0558	10.11
8.800	25.942	25.941	2.467	2.467	1.0040	4.00	0.0545	9.95
9.000	24.519	24.518	2.314	2.314	1.0040	4.03	0.0531	9.95
9.200	23.147	23.146	2.183	2.183	1.0040	4.00	0.0516	10.05
9.400	21.503	21.502	2.056	2.056	1.0040	4.02	0.0494	10.25
9.600	16.982	16.981	1.940	1.940	1.0040	4.02	0.0552	8.98
9.800	15.704	15.702	1.828	1.828	1.0040	4.02	0.0514	9.45
10.000	14.093	14.091	1.707	1.707	1.0040	4.08	0.0458	10.31
10.200	11.655	11.653	1.603	1.603	1.0040	4.08	0.0463	10.01
10.400	9.638	9.637	1.494	1.493	1.0040	4.09	0.0451	10.06
10.600	7.603	7.602	1.376	1.376	1.0040	4.11	0.0450	9.87
10.800	6.109	6.109	1.323	1.323	1.0040	3.97	0.0548	8.09
11.000	5.105	5.104	1.159	1.159	1.0040	4.07	0.0464	9.27
11.200	4.416	4.415	1.027	1.027	1.0040	4.08	0.0447	9.45
11.400	4.074	4.074	0.884	0.884	1.0040	4.09	0.0424	9.76
11.600	3.981	3.981	0.773	0.773	1.0040	4.06	0.0419	9.75
11.800	4.069	4.069	0.644	0.644	1.0040	4.07	0.0416	9.63
12.000	4.416	4.416	0.538	0.538	1.0040	4.07	0.0415	9.50
12.200	5.129	5.129	0.453	0.453	1.0040	4.06	0.0399	9.73

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A3-08PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	34.874	34.874	0.038	0.038	1.0000	3.73	0.0440	13.69
8.400	35.481	35.481	2.855	2.855	1.0000	3.80	0.0432	13.48
8.600	35.892	35.892	2.676	2.676	1.0000	3.74	0.0412	13.94
8.800	34.593	34.593	2.496	2.496	1.0000	3.83	0.0414	13.39
9.000	31.915	31.914	2.338	2.338	1.0000	3.90	0.0421	12.75
9.200	30.974	30.973	2.212	2.212	1.0000	3.84	0.0407	13.00
9.400	29.074	29.072	2.080	2.080	1.0000	3.90	0.0390	13.18
9.600	22.131	22.130	1.974	1.974	1.0000	3.85	0.0472	10.73
9.800	21.111	21.109	1.857	1.857	1.0000	3.90	0.0426	11.58
10.000	18.134	18.132	1.741	1.741	1.0000	3.96	0.0409	11.73
10.200	14.504	14.503	1.637	1.637	1.0000	3.97	0.0428	10.97
10.400	12.331	12.330	1.558	1.557	1.0000	3.90	0.0456	10.19
10.600	10.532	10.530	1.460	1.460	1.0000	3.90	0.0444	10.27
10.800	8.770	8.769	1.347	1.347	1.0000	3.93	0.0417	10.68
11.000	7.006	7.005	1.238	1.238	1.0000	3.94	0.0421	10.38
11.200	5.278	5.278	1.126	1.126	1.0000	3.95	0.0460	9.33
11.400	4.178	4.178	1.013	1.013	1.0000	3.94	0.0495	8.52
11.600	4.027	4.027	0.937	0.937	1.0000	3.87	0.0494	8.64
11.800	4.416	4.415	0.828	0.828	1.0000	3.86	0.0406	10.14
12.000	4.954	4.955	0.697	0.697	1.0000	3.88	0.0347	11.64
12.200	5.656	5.656	0.587	0.587	1.0000	3.88	0.0315	12.61

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A3-10P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATIO DEPTH CM
8.200	25.942	25.941	2.975	2.975	1.0050	4.46	0.0655	8.42
8.400	24.575	24.575	2.805	2.805	1.0050	4.10	0.0649	8.65
8.600	24.746	24.745	2.631	2.631	1.0050	4.01	0.0608	9.12
8.800	22.909	22.908	2.441	2.441	1.0050	4.18	0.0600	8.85
9.000	21.086	21.085	2.288	2.288	1.0050	4.20	0.0587	8.82
9.200	19.275	19.274	2.162	2.162	1.0050	4.13	0.0589	8.67
9.400	17.022	17.020	2.030	2.030	1.0050	4.17	0.0575	8.65
9.600	13.536	13.535	1.924	1.924	1.0050	4.10	0.0655	7.50
9.800	11.708	11.707	1.797	1.797	1.0050	4.17	0.0608	7.85
10.000	9.806	9.805	1.676	1.676	1.0050	4.21	0.0577	8.07
10.200	7.568	7.567	1.567	1.567	1.0050	4.21	0.0612	7.46
10.400	6.187	6.186	1.473	1.472	1.0050	4.16	0.0642	7.01
10.600	5.426	5.425	1.375	1.375	1.0050	4.12	0.0622	7.14
10.800	4.775	4.775	1.262	1.262	1.0050	4.11	0.0576	7.57
11.000	4.159	4.159	1.136	1.136	1.0050	4.11	0.0537	7.97
11.200	3.780	3.780	0.996	0.996	1.0050	4.12	0.0496	8.47
11.400	3.569	3.568	0.853	0.853	1.0050	4.12	0.0472	8.74
11.600	3.573	3.573	0.737	0.737	1.0050	4.10	0.0462	8.79
11.800	3.802	3.802	0.613	0.613	1.0050	4.10	0.0452	8.84
12.000	4.178	4.179	0.507	0.507	1.0050	4.11	0.0454	8.65
12.200	4.842	4.842	0.423	0.423	1.0050	4.11	0.0444	8.69

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A3-10PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	35.075	35.075	0.030	0.030	1.0130	3.70	0.0437	13.85
8.400	32.734	32.734	0.005	0.005	1.0130	3.68	0.0457	12.98
8.600	32.885	32.885	2.683	2.683	1.0130	3.61	0.0439	13.31
8.800	32.295	32.295	2.503	2.503	1.0130	3.70	0.0436	12.94
9.000	28.907	28.906	2.350	2.350	1.0130	3.72	0.0464	11.85
9.200	27.733	27.732	2.224	2.224	1.0130	3.67	0.0455	11.90
9.400	26.699	26.698	2.097	2.097	1.0130	3.70	0.0435	12.13
9.600	22.131	22.130	1.981	1.981	1.0130	3.71	0.0477	10.83
9.800	20.324	20.322	1.869	1.869	1.0130	3.74	0.0458	11.00
10.000	18.429	18.427	1.743	1.743	1.0130	3.85	0.0405	12.01
10.200	15.758	15.756	1.654	1.654	1.0130	3.80	0.0423	11.35
10.400	12.735	12.734	1.555	1.554	1.0130	3.81	0.0438	10.74
10.600	10.556	10.555	1.457	1.457	1.0130	3.81	0.0441	10.47
10.800	9.279	9.278	1.364	1.364	1.0130	3.79	0.0423	10.73
11.000	8.156	8.155	1.250	1.250	1.0130	3.81	0.0380	11.69
11.200	8.232	8.231	1.123	1.123	1.0130	3.84	0.0298	14.60
11.400	5.970	5.970	0.985	0.985	1.0130	3.88	0.0334	12.71
11.600	5.483	5.482	0.874	0.874	1.0130	3.86	0.0331	12.65
11.800	5.339	5.339	0.755	0.755	1.0130	3.86	0.0322	12.78
12.000	5.496	5.496	0.634	0.634	1.0130	3.87	0.0317	12.77
12.200	6.026	6.026	0.524	0.524	1.0130	3.89	0.0312	12.71

DIELECTRIC PROPERTIES OF PM SHALE

SAMPLE NO. AS A1-13D

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DEPTH MEASURED CM	DEPTH CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.500	8.045	8.040	4.990	4.830	1.000	4.52	0.0491	41.37
2.600	8.375	8.376	4.905	4.905	1.000	4.50	0.0490	39.17
2.700	8.910	8.911	2.965	2.965	1.000	4.51	0.0621	30.18
2.800	8.831	8.831	1.960	1.960	1.000	4.51	0.0696	26.75
2.900	9.300	9.301	1.735	1.735	1.000	4.49	0.0706	25.54
3.000	11.912	11.913	1.420	1.420	1.000	4.43	0.0617	28.16
3.100	15.223	15.224	1.150	1.150	1.000	4.41	0.0547	30.90
3.200	19.055	19.055	0.890	0.890	1.000	4.47	0.0505	31.94
3.300	22.131	22.132	0.720	0.720	1.000	4.46	0.0477	32.67
3.400	21.429	21.430	0.570	0.570	1.000	4.48	0.0539	27.92
3.500	27.737	27.738	0.460	0.460	1.000	4.45	0.0441	33.05
3.600	25.943	25.943	0.355	0.355	1.000	4.47	0.0502	28.09
3.700	22.516	22.517	0.290	0.290	1.000	4.42	0.0503	23.02
3.800	20.654	20.654	0.230	0.230	1.000	4.32	0.0456	20.59
3.900	17.835	17.836	0.140	0.140	1.000	4.37	0.0395	16.41
4.000	17.640	17.640	0.090	0.090	1.000	4.35	0.0416	15.59
4.100	14.740	14.740	0.045	0.045	1.000	4.24	0.0403	12.65
4.200	17.398	17.398	0.300	4.712	1.000	4.21	0.0411	15.11
4.300	23.758	23.759	4.492	4.492	1.000	4.24	0.0586	20.29
4.400	25.738	25.738	4.260	4.260	1.000	4.27	0.0527	21.90

DIELECTRIC PROPERTIES OF [illegible] SOILS

SAMPLE NO. AS A3-1-D

FREQUENCY GHZ	V SWR MEASURED	V SWR CALCULATED	DEPTH MEASURED CM	DEPTH CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.500	3.62[illegible]	3.571	[illegible].700	0.700	1.[illegible]30	4.91	0.0560	29.[illegible]
2.[illegible]00	5.953	5.865	1.295	1.295	1.830	5.12	0.0671	27.[illegible]3
2.[illegible]00	[illegible].20[illegible]	8.204	2.615	2.635	1.[illegible]30	4.85	0.0552	32.72
2.[illegible]50	11.695	11.636	2.250	2.250	1.830	4.99	0.0446	39.51
2.[illegible]10	10.541	10.545	1.020	1.020	1.330	4.91	0.0559	30.80
2.[illegible]00	11.954	11.954	1.505	1.505	1.[illegible]30	4.99	0.0585	28.37
2.700	13.339	14.438	1.225	1.2[illegible]	1.[illegible]30	4.86	0.0548	29.26
2.[illegible]00	14.640	14.630	0.250	0.950	1.830	4.92	0.0635	24.20
[illegible].[illegible]00	21.993	21.920	0.775	0.775	1.[illegible]30	4.93	0.0470	31.55
[illegible].[illegible]00	21.954	21.954	0.615	0.615	1.[illegible]30	4.46	0.0522	27.39
[illegible].100	20.701	20.702	0.515	0.515	1.830	4.90	0.0594	23.30
[illegible].200	24.975	24.970	0.410	0.410	1.[illegible]30	4.31	0.0519	25.92
[illegible].[illegible]00	22.136	22.336	0.330	0.330	1.[illegible]30	4.38	0.0609	21.56
[illegible].[illegible]00	25.512	25.514	0.256	0.256	1.830	4.37	0.0565	22.93
[illegible].[illegible]00	13.945	13.935	0.160	0.160	1.[illegible]30	4.96	0.0749	15.35
[illegible].[illegible]00	13.916	13.716	0.120	0.120	1.330	4.84	0.1051	11.96
[illegible].[illegible]00	15.793	14.791	0.125	0.136	1.[illegible]30	4.57	0.0999	12.13
[illegible].[illegible]00	24.[illegible]	24.257	0.240	0.040	1.[illegible]30	4.73	0.0617	18.09
[illegible].[illegible]00	26.951	27.099	[illegible]	4.542	1.8[illegible]	4.73	0.0575	19.58
[illegible].[illegible]00	27.973	27.979	4.01[illegible]	4.41[illegible]	1.[illegible]30	4.79	0.0579	20.56

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. A3 A3-150

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DEPTH MEASURED CM	DEPTH CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.300	6.907	6.933	4.115	4.115	2.015	4.46	0.0445	46.13
2.300	8.229	8.239	3.210	3.210	2.015	4.44	0.0452	43.64
2.400	11.508	11.530	2.250	2.250	2.015	4.40	0.0460	41.26
2.450	13.062	13.063	1.995	1.995	2.015	4.41	0.0459	40.38
2.500	13.952	13.952	1.740	1.740	2.015	4.43	0.0475	38.17
2.600	16.435	16.434	1.230	1.230	2.015	4.47	0.0478	36.32
2.700	17.227	17.229	1.080	1.080	2.015	4.43	0.0509	33.09
2.800	18.471	18.472	0.830	0.830	2.015	4.49	0.0547	29.41
2.900	19.999	19.999	0.700	0.700	2.015	4.42	0.0535	25.27
3.000	21.577	21.578	0.550	0.550	2.015	4.44	0.0542	27.94
3.100	27.353	27.354	0.435	0.435	2.015	4.44	0.0457	31.99
3.200	27.164	27.165	0.345	0.345	2.015	4.41	0.0489	29.56
3.300	22.830	22.830	0.280	0.280	2.015	4.33	0.0513	23.92
3.400	23.469	23.470	0.205	0.205	2.015	4.32	0.0580	23.07
3.500	20.277	20.277	0.115	0.115	2.015	4.38	0.0709	18.41
3.600	18.936	18.937	0.090	0.090	2.015	4.22	0.0747	17.27
3.700	20.332	20.332	0.050	0.050	2.015	4.15	0.0694	18.51
3.800	22.310	22.310	4.677	4.677	2.015	4.26	0.0643	19.24
3.900	24.774	24.774	4.057	4.057	2.015	4.24	0.0558	21.31
4.000	25.453	25.453	4.251	4.251	2.015	4.23	0.0525	22.19

DIELECTRIC PROPERTIES OF [illegible]

SAMPLE NO. AS 13-16D

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DIP MEASURED CM	DIP CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
[illegible]	3.[illegible]	4.259	[illegible]	[illegible]	1.7[illegible]	4.57	0.0[illegible]	[illegible]
[illegible]	4.7[illegible]	4.743	[illegible]	[illegible]	1.7[illegible]	4.4[illegible]	0.0457	[illegible]
[illegible]	6.577	[illegible].577	[illegible]	3.7[illegible]	1.[illegible]	4.51	0.0491	38.1[illegible]
[illegible]	7.[illegible]	7.990	[illegible]	[illegible]	1.7[illegible]	4.50	0.0519	35.4[illegible]
[illegible]	7.[illegible]	7.[illegible]	[illegible]	[illegible].758	1.7[illegible]	4.50	0.0514	35.01
[illegible]	[illegible].661	[illegible].661	2.[illegible]	2.[illegible]	1.7[illegible]	4.51	0.0523	33.05
[illegible]	11.[illegible]	11.562	1.[illegible]	1.[illegible]	1.7[illegible]	4.51	0.0521	31.[illegible]
[illegible]	13.[illegible]	13.[illegible]	1.[illegible]	1.[illegible]	1.7[illegible]	4.55	0.0[illegible]	30.1[illegible]
[illegible]	15.[illegible]	15.[illegible]	1.[illegible]	1.0[illegible]	1.7[illegible]	4.55	0.0[illegible]	29.[illegible]
[illegible]	15.704	15.70[illegible]	0.[illegible]	0.[illegible]	1.7[illegible]	4.55	0.05[illegible]	26.[illegible]
[illegible]	17.041	17.042	0.713	0.713	1.7[illegible]	4.55	0.0578	25.[illegible]
[illegible]	16.789	16.789	0.[illegible]	0.[illegible]	1.7[illegible]	4.54	0.0[illegible]	22.04
[illegible]	17.[illegible]	17.042	0.[illegible]	0.[illegible]	1.7[illegible]	4.47	0.065[illegible]	20.[illegible]
[illegible]	14.[illegible]	14.[illegible]	0.[illegible]	0.[illegible]	1.7[illegible]	4.50	0.0[illegible]	15.6[illegible]
[illegible]	11.[illegible]	11.377	0.[illegible]	0.[illegible]	1.7[illegible]	4.29	0.1047	12.59
[illegible]	16.[illegible]	16.[illegible]	0.[illegible]	0.[illegible]	1.7[illegible]	4.23	0.071[illegible]	1[illegible].02
[illegible]	21.[illegible]	21.[illegible]	0.[illegible]	0.[illegible]	1.7[illegible]	4.23	0.05[illegible]	21.4[illegible]
[illegible]	[illegible]	[illegible]	0.1[illegible]	0.158	1.7[illegible]	4.38	0.061[illegible]	19.61
[illegible]	20.[illegible]	20.[illegible]	0.[illegible]	0.[illegible]	1.7[illegible]	4.40	0.06[illegible]	16.79
[illegible]	1[illegible]	1[illegible]	0.[illegible]	[illegible]	1.7[illegible]	4.31	0.070[illegible]	1[illegible]

DIELECTRIC PPOPERTIES OF OIL SHALE

SAMPLE NO. AS A3-17PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.200	6.145	6.145	12.463	12.462	1.762	4.37	0.0344	60.36
2.300	7.362	7.363	4.743	4.743	1.762	4.87	0.0368	51.13
2.400	8.943	8.944	4.683	4.683	1.762	4.34	0.0316	60.39
2.450	9.920	9.920	3.883	3.883	1.762	4.35	0.0320	58.32
2.500	11.376	11.377	3.323	3.323	1.762	4.35	0.0310	58.98
2.600	13.820	13.821	2.443	2.443	1.762	4.40	0.0319	54.90
2.700	16.406	16.407	1.918	1.918	1.762	4.39	0.0320	52.74
2.800	19.055	19.055	1.478	1.478	1.762	4.46	0.0332	48.56
2.900	21.802	21.803	1.203	1.203	1.762	4.46	0.0332	46.92
3.000	22.413	22.414	0.948	0.948	1.762	4.53	0.0375	39.80
3.100	23.094	23.095	0.768	0.768	1.762	4.57	0.0409	35.27
3.200	18.450	18.451	0.598	0.598	1.762	4.65	0.0579	23.89
3.300	9.672	9.672	0.473	0.473	1.762	4.62	0.1210	11.14
3.400	5.508	5.508	0.508	0.508	1.762	4.12	0.1939	7.16
3.500	10.965	10.965	0.513	0.513	1.762	4.04	0.0942	14.42
3.600	17.179	17.180	0.418	0.418	1.762	4.08	0.0644	20.38
3.700	23.578	23.578	0.338	0.338	1.762	4.10	0.0496	25.68
3.800	32.885	32.886	0.228	0.228	1.762	4.25	0.0390	31.22
3.900	38.503	38.504	0.168	0.168	1.762	4.26	0.0344	34.43
4.000	39.491	39.492	0.103	0.103	1.762	4.31	0.0348	33.08

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AS A3-18PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.200	22.029	22.030	2.420	2.420	2.350	4.30	0.0342	61.16
2.300	26.363	26.365	1.815	1.815	2.350	4.25	0.0309	65.22
2.400	30.276	30.277	1.340	1.340	2.350	4.27	0.0311	61.97
2.450	37.801	37.803	1.140	1.140	2.350	4.31	0.0270	69.57
2.500	38.019	38.020	0.965	0.965	2.350	4.35	0.0290	63.04
2.600	35.975	35.977	0.720	0.720	2.350	4.39	0.0341	51.37
2.700	37.540	37.541	0.550	0.550	2.350	4.38	0.0350	48.31
2.800	43.501	43.502	0.360	0.360	2.350	4.50	0.0334	48.10
2.900	40.156	40.157	0.240	0.240	2.350	4.51	0.0377	41.13
3.000	33.381	33.382	0.130	0.130	2.350	4.53	0.0467	32.02
3.100	25.206	25.206	0.010	0.010	2.350	4.63	0.0633	22.61
3.200	13.567	13.567	6.120	6.120	2.350	4.49	0.1152	12.24
3.300	12.735	12.735	5.827	5.827	2.350	4.15	0.1155	12.31
3.400	19.838	19.838	5.500	5.500	2.350	4.10	0.0712	19.47
3.500	21.429	21.428	5.152	5.152	2.350	4.20	0.0635	20.97
3.600	24.127	24.126	4.869	4.869	2.350	4.16	0.0531	24.50
3.700	22.803	22.803	4.582	4.581	2.350	4.21	0.0511	24.61
3.800	18.176	18.175	4.322	4.322	2.350	4.22	0.0573	21.35
3.900	17.318	17.317	4.092	4.092	2.350	4.17	0.0538	22.28
4.000	18.197	18.196	3.856	3.856	2.350	4.17	0.0440	26.58

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A3-C1

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	32.137	32.134	2.842	2.842	1.3350	3.19	0.0324	20.13
8.400	26.822	26.820	2.607	2.607	1.3350	3.18	0.0333	19.10
8.600	21.627	21.625	2.394	2.394	1.3350	3.19	0.0344	18.06
8.800	19.098	19.096	2.194	2.194	1.3350	3.20	0.0314	19.33
9.000	15.170	15.169	2.008	2.008	1.3350	3.20	0.0315	18.79
9.200	12.374	12.372	1.834	1.834	1.3350	3.19	0.0311	18.68
9.400	9.897	9.895	1.657	1.656	1.3350	3.19	0.0308	18.49
9.600	7.989	7.988	1.474	1.474	1.3350	3.18	0.0304	18.34
9.800	6.683	6.683	1.284	1.284	1.3350	3.18	0.0299	18.25
10.000	6.039	6.039	1.111	1.111	1.3350	3.17	0.0296	18.14
10.200	5.788	5.788	0.924	0.924	1.3350	3.17	0.0292	17.99
10.400	5.963	5.964	0.758	0.757	1.3350	3.17	0.0293	17.58
10.600	6.516	6.517	0.625	0.625	1.3350	3.17	0.0294	17.23
10.800	7.345	7.346	0.507	0.507	1.3350	3.17	0.0298	16.64
11.000	8.414	8.415	0.426	0.426	1.3350	3.16	0.0295	16.55
11.200	9.840	9.841	0.344	0.344	1.3350	3.17	0.0295	16.25
11.400	11.259	11.260	0.288	0.288	1.3350	3.16	0.0291	16.20
11.600	12.604	12.605	0.238	0.238	1.3350	3.15	0.0292	15.86
11.800	13.646	13.647	0.190	0.190	1.3350	3.16	0.0304	14.95
12.000	14.622	14.623	0.155	0.155	1.3350	3.16	0.0309	14.48
12.200	15.849	15.850	0.120	0.120	1.3350	3.16	0.0310	14.18

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A3-C2

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	29.785	29.783	2.842	2.842	1.3350	3.19	0.0350	18.65
8.400	24.774	24.772	2.605	2.605	1.3350	3.19	0.0359	17.70
8.600	20.160	20.158	2.389	2.389	1.3350	3.21	0.0364	17.03
8.800	16.256	16.254	2.194	2.194	1.3350	3.20	0.0368	16.45
9.000	13.630	13.628	2.008	2.008	1.3350	3.20	0.0351	16.89
9.200	11.092	11.090	1.824	1.824	1.3350	3.21	0.0337	17.18
9.400	8.580	8.579	1.647	1.647	1.3350	3.20	0.0346	16.41
9.600	7.047	7.046	1.459	1.459	1.3350	3.20	0.0334	16.63
9.800	5.977	5.977	1.259	1.259	1.3350	3.21	0.0323	16.83
10.000	5.572	5.572	1.071	1.071	1.3350	3.20	0.0310	17.19
10.200	5.333	5.333	0.889	0.889	1.3350	3.20	0.0315	16.61
10.400	5.572	5.572	0.728	0.727	1.3350	3.20	0.0317	16.16
10.600	6.131	6.131	0.585	0.585	1.3350	3.21	0.0324	15.50
10.800	6.918	6.919	0.477	0.477	1.3350	3.21	0.0331	14.91
11.000	7.943	7.944	0.391	0.391	1.3350	3.21	0.0334	14.50
11.200	9.110	9.110	0.323	0.323	1.3350	3.20	0.0334	14.25
11.400	10.046	10.047	0.265	0.265	1.3350	3.20	0.0346	13.53
11.600	10.940	10.940	0.218	0.218	1.3350	3.20	0.0356	12.92
11.800	11.233	11.234	0.170	0.170	1.3350	3.22	0.0392	11.50
12.000	11.092	11.092	0.135	0.135	1.3350	3.21	0.0433	10.25
12.200	10.654	10.654	0.115	0.115	1.3350	3.17	0.0469	9.37

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AS AS-C3

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	PHIN MEASURED CM	PHIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.200	9.083	9.084	3.895	3.895	2.785	3.05	0.0430	57.79
2.300	13.032	13.033	2.060	2.060	2.785	3.04	0.0403	59.02
2.400	14.454	14.455	1.950	1.950	2.785	3.04	0.0435	52.43
2.450	14.757	14.758	1.865	1.865	2.785	3.05	0.0466	47.87
2.500	15.101	15.102	1.420	1.420	2.785	3.07	0.0497	43.89
2.600	18.032	18.033	1.110	1.110	2.785	3.05	0.0517	40.63
2.700	19.454	19.454	0.965	0.965	2.785	3.04	0.0466	43.56
2.800	23.361	23.362	0.615	0.615	2.785	3.09	0.0434	44.67
2.900	24.889	24.889	0.445	0.445	2.785	3.10	0.0434	45.05
3.000	24.350	24.351	0.295	0.295	2.785	3.11	0.0468	38.52
3.100	24.379	24.379	0.175	0.175	2.785	3.11	0.0481	36.31
3.200	22.542	22.542	0.055	0.055	2.785	3.13	0.0530	31.77
3.300	18.793	18.793	5.822	5.822	2.785	3.10	0.0629	26.14
3.400	18.408	18.408	5.485	5.485	2.785	3.03	0.0625	23.82
3.500	19.320	19.319	5.137	5.137	2.785	3.06	0.0577	27.05
3.600	20.845	20.844	4.844	4.844	2.785	3.03	0.0508	30.00
3.700	23.067	23.067	4.577	4.576	2.785	2.99	0.0432	34.55
3.800	22.672	22.671	4.257	4.257	2.785	3.08	0.0587	26.97
3.900	21.257	21.256	4.017	4.017	2.785	3.05	0.0574	27.52
4.000	19.387	19.385	3.771	3.771	2.785	3.04	0.0579	26.14

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AS A3-C4

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.200	[illegible]	9.443	[illegible]	3.905	2.785	3.05	0.0416	59.68
2.300	13.397	13.398	2.660	2.660	2.785	3.04	0.0392	60.33
2.400	14.962	14.963	1.960	1.960	2.785	3.03	0.0413	54.61
2.450	14.962	14.963	1.[illegible]	1.693	2.785	3.03	0.0452	49.44
2.500	15.704	15.704	1.450	1.450	2.785	3.05	0.0469	46.57
2.600	17.140	17.140	1.120	1.120	2.785	3.04	0.0481	43.75
2.700	20.324	20.324	[illegible]	0.895	2.785	3.01	0.0436	46.69
2.800	24.238	24.239	0.[illegible]	0.645	2.785	3.06	0.0409	47.70
2.900	25.410	25.410	0.475	0.475	2.785	3.06	0.0415	45.30
3.000	25.264	25.264	0.315	0.315	2.785	3.08	0.0444	40.79
3.100	23.961	23.961	0.205	0.205	2.785	3.06	0.0479	36.73
3.200	22.909	22.909	0.105	0.105	2.785	3.04	0.0507	33.76
3.300	19.724	19.724	0.015	0.015	2.785	3.02	0.0588	28.31
3.400	20.045	20.045	5.515	5.515	2.785	2.97	0.0568	28.68
3.500	20.654	20.653	5.157	5.157	2.785	3.02	0.0539	29.14
3.600	21.062	21.062	4.874	4.874	2.785	2.97	0.0506	30.45
3.700	22.646	22.646	4.587	4.586	2.785	2.97	0.0442	33.88
3.800	21.503	21.502	4.287	4.287	2.785	3.03	0.0419	34.47
3.900	20.184	20.182	[illegible].017	[illegible].017	2.785	3.05	0.0394	35.62
4.000	17.278	17.277	3.751	3.751	2.785	3.07	0.0393	34.65

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AU A3-C5

FREQUENCY MHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN / CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
100.00	100.000	100.000	144.654	144.653	6.401	****	0.0000	0.00
150.00	100.000	100.000	93.139	93.139	6.401	5.28	0.0000	0.00
200.00	100.000	100.000	68.097	68.097	6.401	3.76	0.0000	0.00
250.00	100.000	100.000	52.867	52.867	6.401	3.62	0.0000	0.00
300.00	90.000	89.998	42.764	42.764	6.401	3.11	0.1299	139.27
350.00	70.000	69.999	35.299	35.299	6.401	3.10	0.0971	159.62
400.00	43.000	42.999	29.623	29.623	6.401	3.01	0.1018	135.16
450.00	68.000	67.999	25.129	25.129	6.401	2.90	0.0445	280.19
500.00	46.000	45.999	21.258	21.258	6.401	2.93	0.0435	256.24
400.00	100.000	100.000	29.483	29.483	6.401	3.15	0.0000	0.00
450.00	45.000	44.998	25.029	25.029	6.401	2.98	0.0637	192.79
500.00	33.000	32.999	21.279	21.279	6.401	2.92	0.0611	182.82
550.00	24.000	23.999	17.789	17.789	6.401	3.01	0.0557	179.70
600.00	19.800	19.799	15.022	15.022	6.401	2.95	0.0525	176.44
650.00	16.300	16.299	12.689	12.689	6.401	2.87	0.0531	163.15
700.00	14.200	14.200	10.399	10.399	6.401	2.90	0.0510	157.08
750.00	13.400	13.400	8.439	8.439	6.401	2.91	0.0490	152.42
800.00	12.800	12.800	6.769	6.769	6.401	2.93	0.0495	140.83
850.00	13.900	13.900	5.379	5.379	6.401	2.95	0.0464	140.84
900.00	13.600	13.600	4.325	4.325	6.401	2.94	0.0498	124.10
915.00	13.600	13.600	4.079	4.079	6.401	2.93	0.0506	120.43
950.00	14.300	14.300	3.559	3.559	6.401	2.90	0.0501	117.94
1000.00	15.500	15.500	3.089	3.089	6.401	2.78	0.0479	119.47
1100.00	19.000	19.001	2.129	2.129	6.401	2.69	0.0430	122.95
1200.00	17.700	17.700	1.119	1.119	6.401	2.79	0.0539	88.46

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AS 44-01P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.200	42.462	42.460	0.594	0.594	2.406	6.23	0.0674	25.80
2.300	44.771	44.771	0.469	0.469	2.406	6.06	0.0535	31.52
2.400	42.855	42.855	0.269	0.269	2.406	6.21	0.0562	28.40
2.450	51.940	51.940	0.179	0.179	2.406	6.32	0.0467	33.23
2.500	57.128	57.128	0.099	0.099	2.406	6.41	0.0423	35.66
2.600	42.658	42.658	9.572	9.572	2.406	6.47	0.0543	26.60
2.700	35.156	35.155	8.599	8.599	2.406	6.35	0.0612	22.93
2.800	38.371	38.370	7.762	7.762	2.406	6.54	0.0505	26.40
2.900	36.141	36.140	7.124	7.124	2.406	6.38	0.0480	27.16
3.000	26.822	26.821	6.542	6.542	2.406	6.40	0.0549	22.92
3.100	28.708	28.705	6.020	6.020	2.406	6.42	0.0413	29.40
3.200	20.797	20.795	5.544	5.544	2.406	6.43	0.0442	26.63
3.300	10.544	10.542	5.101	5.101	2.406	6.43	0.0653	17.48
3.400	5.929	5.928	4.714	4.714	2.406	6.37	0.0891	12.49
3.500	5.559	5.558	4.356	4.356	2.406	6.20	0.0768	14.28
3.600	4.482	4.481	3.843	3.843	2.406	6.23	0.0616	17.26
3.700	3.055	3.054	3.296	3.295	2.406	6.23	0.0622	16.62
3.800	2.455	2.455	2.651	2.650	2.406	6.21	0.0602	16.76
3.900	2.707	2.707	2.346	2.346	2.406	5.99	0.0536	18.65
4.000	3.090	3.091	1.394	1.394	2.406	6.20	0.0559	17.15

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A4-02P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATIC DEPTH CM
8.200	18.450	18.448	2.830	2.830	1.0100	5.56	0.0653	7.57
8.400	14.421	14.419	2.570	2.570	1.0100	5.73	0.0584	8.13
8.600	11.220	11.218	2.376	2.376	1.0100	5.64	0.0615	7.60
8.800	7.499	7.498	2.149	2.149	1.0100	5.75	0.0607	7.46
9.000	5.309	5.308	1.913	1.913	1.0100	5.81	0.0552	7.98
9.200	3.432	3.431	1.657	1.657	1.0100	5.86	0.0558	7.68
9.400	1.972	1.972	1.302	1.301	1.0100	5.96	0.0658	6.33
9.600	1.216	1.216	0.920	0.920	1.0100	5.92	0.1028	3.98
9.800	1.288	1.288	0.988	0.988	1.0100	5.64	0.1003	4.09
10.000	1.862	1.862	0.660	0.660	1.0100	5.67	0.0798	5.02
10.200	2.483	2.484	0.518	0.518	1.0100	5.65	0.0735	5.36
10.400	3.954	3.954	0.400	0.400	1.0100	5.70	0.0606	6.34
10.600	5.483	5.484	0.320	0.320	1.0100	5.71	0.0551	6.84
10.800	6.546	6.547	0.245	0.245	1.0100	5.75	0.0593	6.21
11.000	6.918	6.919	0.180	0.180	1.0100	5.83	0.0720	4.99
11.200	5.502	5.502	0.135	0.135	1.0100	5.80	0.1076	3.29
11.400	4.503	4.503	0.150	0.150	1.0100	5.46	0.1183	3.04
11.600	7.612	7.613	0.145	0.145	1.0100	5.43	0.0720	4.91
11.800	11.092	11.093	0.115	0.115	1.0100	5.48	0.0557	6.21
12.000	13.213	13.214	0.075	0.075	1.0100	5.61	0.0546	6.15
12.200	14.791	14.792	0.050	0.050	1.0100	5.65	0.0527	6.25

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 44-02PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATIO DEPTH CM
8.200	23.933	23.931	2.882	2.882	1.0075	5.19	0.0606	9.44
8.400	21.953	21.951	2.643	2.643	1.0075	5.30	0.0522	9.45
8.600	19.953	19.950	2.438	2.438	1.0075	5.32	0.0457	10.53
8.800	18.435	18.432	2.278	2.278	1.0075	5.43	0.0417	11.15
9.000	11.482	11.480	2.045	2.045	1.0075	5.43	0.0420	10.85
9.200	9.047	9.045	1.849	1.849	1.0075	5.46	0.0374	11.89
9.400	6.166	6.165	1.644	1.644	1.0075	5.48	0.0384	11.29
9.600	4.375	4.374	1.426	1.426	1.0075	5.48	0.0399	10.66
9.800	3.396	3.396	1.151	1.151	1.0075	5.51	0.0401	10.35
10.000	3.217	3.217	0.903	0.902	1.0075	5.51	0.0408	9.98
10.200	3.296	3.297	0.675	0.675	1.0075	5.52	0.0456	8.75
10.400	3.673	3.673	0.523	0.522	1.0075	5.50	0.0502	7.79
10.600	4.232	4.232	0.432	0.432	1.0075	5.45	0.0520	7.42
10.800	5.266	5.267	0.378	0.377	1.0075	5.38	0.0477	8.00
11.000	6.699	6.700	0.313	0.312	1.0075	5.36	0.0450	8.34
11.200	8.318	8.319	0.258	0.257	1.0075	5.35	0.0432	8.53
11.400	8.680	8.681	0.203	0.202	1.0075	5.37	0.0504	7.17
11.600	9.397	9.398	0.182	0.182	1.0075	5.29	0.0497	7.21
11.800	13.032	13.033	0.153	0.152	1.0075	5.28	0.0401	8.77
12.000	14.928	14.929	0.118	0.117	1.0075	5.32	0.0401	8.59
12.200	16.634	16.635	0.088	0.087	1.0075	5.36	0.0403	8.39

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A4-03P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DEPTH MEASURED CM	DEPTH CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.000	17.171	17.177	2.794	2.794	1.0125	5.77	0.0604	8.03
8.100	14.454	14.452	2.540	2.540	1.0125	5.95	0.0510	9.21
8.200	11.353	11.348	2.423	2.423	1.0125	5.82	0.0489	9.41
8.300	8.165	8.164	2.073	2.073	1.0125	5.91	0.0429	10.40
9.000	5.549	5.539	1.920	1.920	1.0125	5.95	0.0413	10.52
9.200	3.877	3.876	1.550	1.550	1.0125	5.94	0.0418	10.18
9.400	2.834	2.834	1.249	1.249	1.0125	5.95	0.0438	9.51
9.600	2.630	2.630	0.977	0.977	1.0125	5.91	0.0466	8.77
9.800	2.723	2.723	0.703	0.702	1.0125	5.91	0.0529	7.57
10.000	2.985	2.986	0.557	0.557	1.0125	5.84	0.0584	6.77
10.200	4.267	4.267	0.470	0.470	1.0125	5.78	0.0486	8.02
10.400	6.273	6.273	0.378	0.377	1.0125	5.77	0.0415	9.20
10.600	8.111	8.111	0.298	0.297	1.0125	5.79	0.0407	9.20
10.800	9.719	9.719	0.249	0.247	1.0125	5.75	0.0401	9.20
11.000	10.471	10.473	0.206	0.205	1.0125	5.72	0.0431	8.41
11.200	11.668	11.668	0.173	0.172	1.0125	5.69	0.0437	8.18
11.400	14.174	14.175	0.124	0.127	1.0125	5.77	0.0431	8.09
11.600	15.188	15.189	0.108	0.107	1.0125	5.71	0.0431	8.00
11.800	16.807	16.809	0.092	0.092	1.0125	5.64	0.0406	8.38
12.000	17.418	17.419	0.063	0.062	1.0125	5.70	0.0435	7.66

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 44-03PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	23.227	23.224	2.812	2.812	1.0000	5.79	0.0483	10.03
8.400	20.022	20.019	2.557	2.557	1.0000	5.90	0.0398	11.75
8.600	15.453	15.450	2.336	2.336	1.0000	5.91	0.0378	12.07
8.800	10.495	10.493	2.099	2.099	1.0000	5.98	0.0364	12.17
9.000	6.683	6.682	1.843	1.843	1.0000	6.04	0.0362	11.91
9.200	3.882	3.881	1.592	1.592	1.0000	6.04	0.0437	9.67
9.400	2.344	2.344	1.372	1.371	1.0000	5.99	0.0589	7.05
9.600	2.399	2.399	1.140	1.140	1.0000	5.89	0.0523	7.83
9.800	3.037	3.038	0.883	0.883	1.0000	5.86	0.0419	9.60
10.000	3.890	3.891	0.580	0.580	1.0000	5.97	0.0434	9.01
10.200	4.315	4.316	0.408	0.408	1.0000	6.03	0.0552	6.90
10.400	3.859	3.860	0.295	0.295	1.0000	6.03	0.0836	4.47
10.600	2.455	2.455	0.240	0.240	1.0000	5.69	0.1400	2.70
10.800	2.786	2.787	0.363	0.363	1.0000	5.36	0.0889	4.29
11.000	5.636	5.637	0.308	0.309	1.0000	5.42	0.0538	6.93
11.200	8.982	8.983	0.245	0.245	1.0000	5.47	0.0424	8.60
11.400	11.735	11.737	0.190	0.190	1.0000	5.52	0.0394	9.03
11.600	14.774	14.776	0.175	0.175	1.0000	5.41	0.0328	10.78
11.800	16.885	16.886	0.128	0.128	1.0000	5.51	0.0347	9.93
12.000	14.928	14.929	0.095	0.095	1.0000	5.55	0.0446	7.57
12.200	14.302	14.303	0.075	0.075	1.0000	5.54	0.0388	8.57

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A4-04P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	16.406	16.403	2.763	2.763	1.0090	6.00	0.0551	8.63
8.400	12.853	12.851	2.516	2.516	1.0090	6.01	0.0517	9.97
8.600	9.408	9.406	2.277	2.277	1.0090	6.04	0.0486	9.29
8.800	6.237	6.236	2.027	2.027	1.0090	6.08	0.0476	9.24
9.000	3.846	3.845	1.754	1.754	1.0090	6.12	0.0497	8.62
9.200	2.427	2.426	1.423	1.423	1.0090	6.16	0.0545	7.68
9.400	1.462	1.462	1.016	1.016	1.0090	6.17	0.0812	5.04
9.600	1.288	1.288	0.921	0.921	1.0090	5.94	0.0968	4.22
9.800	1.728	1.728	0.574	0.574	1.0090	5.97	0.0922	4.33
10.000	1.540	1.540	0.481	0.481	1.0090	5.73	0.1129	3.54
10.200	2.291	2.291	0.514	0.514	1.0090	5.65	0.0794	4.96
10.400	3.958	3.959	0.421	0.421	1.0090	5.67	0.0575	6.70
10.600	6.131	6.132	0.321	0.321	1.0090	5.73	0.0493	7.63
10.800	7.762	7.763	0.251	0.251	1.0090	5.76	0.0492	7.49
11.000	8.610	8.611	0.191	0.191	1.0090	5.81	0.0556	6.48
11.200	8.194	8.195	0.156	0.156	1.0090	5.78	0.0666	5.33
11.400	8.175	8.176	0.121	0.121	1.0090	5.79	0.0767	4.54
11.600	7.762	7.763	0.111	0.111	1.0090	5.66	0.0827	4.19
11.800	10.703	10.704	0.096	0.096	1.0090	5.62	0.0830	5.42
12.000	13.474	13.475	0.059	0.059	1.0090	5.76	0.0573	5.79
12.200	15.578	15.578	0.036	0.036	1.0090	5.80	0.0525	6.19

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 44-04PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	25.586	25.583	2.831	2.831	1.0110	5.53	0.0472	10.49
8.400	22.594	22.591	2.584	2.584	1.0110	5.62	0.0393	12.04
8.600	19.275	19.272	2.335	2.335	1.0110	5.77	0.0305	15.16
8.800	14.289	14.286	2.155	2.155	1.0110	5.67	0.0334	13.62
9.000	10.387	10.385	1.932	1.932	1.0110	5.71	0.0309	14.34
9.200	7.943	7.942	1.721	1.721	1.0110	5.69	0.0292	14.88
9.400	5.477	5.475	1.481	1.480	1.0110	5.69	0.0306	13.92
9.600	4.084	4.087	1.233	1.233	1.0110	5.67	0.0331	12.60
9.800	3.935	3.936	0.982	0.982	1.0110	5.65	0.0322	12.71
10.000	4.395	4.396	0.769	0.769	1.0110	5.62	0.0314	12.81
10.200	5.373	5.371	0.594	0.594	1.0110	5.61	0.0311	12.71
10.400	6.496	6.495	0.469	0.469	1.0110	5.60	0.0320	12.12
10.600	7.186	7.187	0.379	0.379	1.0110	5.57	0.0356	10.71
10.800	7.413	7.414	0.314	0.314	1.0110	5.53	0.0413	9.11
11.000	8.251	8.252	0.269	0.269	1.0110	5.47	0.0425	8.72
11.200	10.965	10.966	0.227	0.227	1.0110	5.45	0.0370	9.88
11.400	13.916	13.917	0.184	0.184	1.0110	5.45	0.0341	10.50
11.600	16.711	16.712	0.152	0.152	1.0110	5.44	0.0320	11.01
11.800	19.838	19.840	0.127	0.127	1.0110	5.41	0.0296	11.76
12.000	20.606	20.608	0.092	0.092	1.0110	5.48	0.0325	10.45
12.200	23.335	23.336	0.069	0.069	1.0110	5.49	0.0309	10.80

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 44-05P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	17.278	17.276	2.799	2.799	1.0080	5.79	0.0612	7.90
8.400	14.256	14.254	2.544	2.544	1.0080	5.88	0.0527	8.99
8.600	9.750	9.748	2.318	2.318	1.0080	5.91	0.0551	8.28
8.800	5.922	5.921	2.068	2.068	1.0080	6.01	0.0566	7.31
9.000	3.890	3.890	1.855	1.855	1.0080	5.99	0.0619	7.00
9.200	3.292	3.292	1.616	1.616	1.0080	5.94	0.0535	7.96
9.400	2.541	2.541	1.304	1.303	1.0080	5.95	0.0515	8.08
9.600	2.239	2.239	1.002	1.002	1.0080	5.93	0.0546	7.47
9.800	2.570	2.571	0.785	0.785	1.0080	5.87	0.0522	7.71
10.000	3.815	3.816	0.602	0.602	1.0080	5.86	0.0430	9.17
10.200	5.352	5.353	0.455	0.455	1.0080	5.88	0.0403	9.58
10.400	6.879	6.880	0.372	0.372	1.0080	5.84	0.0385	9.87
10.600	8.035	8.036	0.297	0.297	1.0080	5.83	0.0411	9.08
10.800	9.057	9.059	0.242	0.242	1.0080	5.82	0.0438	8.36
11.000	9.506	9.507	0.202	0.202	1.0080	5.78	0.0481	7.50
11.200	10.304	10.305	0.177	0.177	1.0080	5.70	0.0484	7.37
11.400	12.560	12.561	0.142	0.142	1.0080	5.71	0.0456	7.69
11.600	13.836	13.837	0.112	0.112	1.0080	5.72	0.0464	7.41
11.800	15.170	15.172	0.100	0.100	1.0080	5.62	0.0437	7.91
12.000	17.219	17.220	0.072	0.072	1.0080	5.66	0.0425	7.87
12.200	19.297	19.298	0.052	0.052	1.0080	5.66	0.0401	8.21

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 14-05PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	25.293	25.291	2.854	2.854	1.0075	5.40	0.0522	9.59
8.400	21.429	21.426	2.603	2.603	1.0075	5.56	0.0454	10.62
8.600	18.365	18.363	2.408	2.408	1.0075	5.49	0.0436	10.86
8.800	13.614	13.612	2.188	2.188	1.0075	5.60	0.0400	11.47
9.000	9.661	9.659	1.965	1.965	1.0075	5.67	0.0370	12.04
9.200	6.808	6.806	1.749	1.749	1.0075	5.68	0.0364	11.94
9.400	3.990	3.990	1.489	1.489	1.0075	5.73	0.0420	10.09
9.600	2.265	2.264	1.221	1.221	1.0075	5.74	0.0586	7.08
9.800	1.738	1.738	1.161	1.160	1.0075	5.54	0.0780	5.30
10.000	2.585	2.585	0.913	0.912	1.0075	5.49	0.0508	8.01
10.200	3.886	3.886	0.671	0.670	1.0075	5.53	0.0389	10.24
10.400	5.433	5.433	0.503	0.502	1.0075	5.56	0.0356	10.94
10.600	6.745	6.746	0.383	0.382	1.0075	5.59	0.0375	10.16
10.800	6.942	6.943	0.303	0.302	1.0075	5.59	0.0456	8.19
11.000	5.591	5.592	0.236	0.235	1.0075	5.58	0.0701	5.24
11.200	5.433	5.433	0.238	0.237	1.0075	5.37	0.0702	5.24
11.400	8.740	8.741	0.213	0.212	1.0075	5.33	0.0480	7.55
11.600	13.002	13.003	0.168	0.167	1.0075	5.38	0.0384	9.23
11.800	16.788	16.789	0.142	0.142	1.0075	5.34	0.0326	10.73
12.000	19.098	19.100	0.097	0.097	1.0075	5.47	0.0343	9.91
12.200	20.725	20.726	0.073	0.072	1.0075	5.49	0.0344	9.70

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 14-06P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	14.012	14.010	2.741	2.741	1.0110	6.10	0.0584	8.07
8.400	11.156	11.154	2.469	2.469	1.0110	6.18	0.0488	9.37
8.600	7.870	7.869	2.225	2.225	1.0110	6.18	0.0478	9.34
8.800	5.278	5.277	1.960	1.960	1.0110	6.20	0.0461	9.44
9.000	3.703	3.702	1.662	1.662	1.0110	6.21	0.0436	9.77
9.200	2.884	2.884	1.331	1.331	1.0110	6.21	0.0426	9.77
9.400	2.600	2.600	0.992	0.992	1.0110	6.19	0.0454	8.98
9.600	3.020	3.020	0.749	0.749	1.0110	6.15	0.0454	8.84
9.800	3.806	3.807	0.559	0.559	1.0110	6.14	0.0464	8.47
10.000	5.058	5.059	0.419	0.419	1.0110	6.16	0.0471	8.16
10.200	6.457	6.458	0.347	0.347	1.0110	6.10	0.0449	8.44
10.400	7.962	7.963	0.289	0.289	1.0110	6.06	0.0435	8.56
10.600	9.141	9.142	0.239	0.239	1.0110	6.02	0.0449	8.17
10.800	10.174	10.175	0.199	0.199	1.0110	5.98	0.0466	7.75
11.000	11.708	11.710	0.154	0.154	1.0110	6.02	0.0484	7.30
11.200	12.190	12.191	0.134	0.134	1.0110	5.94	0.0498	7.03
11.400	12.023	12.024	0.104	0.104	1.0110	5.94	0.0566	6.07
11.600	12.560	12.561	0.089	0.089	1.0110	5.86	0.0566	6.00
11.800	14.997	14.998	0.074	0.074	1.0110	5.80	0.0494	6.80
12.000	16.558	16.558	0.044	0.044	1.0110	5.89	0.0491	6.68
12.200	17.721	17.722	0.019	0.019	1.0110	5.97	0.0482	6.65

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A4-06PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	24.632	24.629	2.819	2.819	1.0125	5.59	0.0468	10.51
8.400	20.965	20.962	2.568	2.568	1.0125	5.69	0.0399	11.93
8.600	16.653	16.651	2.353	2.353	1.0125	5.69	0.0380	12.24
8.800	12.106	12.104	2.123	2.123	1.0125	5.76	0.0349	12.94
9.000	8.851	8.849	1.900	1.900	1.0125	5.77	0.0328	13.45
9.200	6.546	6.545	1.664	1.664	1.0125	5.77	0.0309	13.98
9.400	4.764	4.764	1.399	1.399	1.0125	5.78	0.0310	13.62
9.600	4.018	4.018	1.126	1.126	1.0125	5.76	0.0314	13.20
9.800	4.027	4.027	0.873	0.872	1.0125	5.75	0.0320	12.70
10.000	4.797	4.798	0.658	0.657	1.0125	5.75	0.0320	12.45
10.200	6.074	6.075	0.516	0.515	1.0125	5.73	0.0314	12.44
10.400	7.647	7.648	0.398	0.397	1.0125	5.74	0.0324	11.83
10.600	9.005	9.007	0.329	0.327	1.0125	5.70	0.0333	11.34
10.800	10.139	10.141	0.267	0.267	1.0125	5.68	0.0356	10.40
11.000	10.940	10.941	0.222	0.222	1.0125	5.65	0.0385	9.49
11.200	11.926	11.927	0.052	0.052	1.0125	6.62	0.0733	4.52
11.400	13.677	13.679	0.153	0.152	1.0075	5.66	0.0399	8.82
11.600	15.885	15.887	0.133	0.132	1.0075	5.59	0.0368	9.45
11.800	19.454	19.455	0.108	0.107	1.0075	5.58	0.0330	10.39
12.000	20.559	20.560	0.078	0.077	1.0075	5.63	0.0348	9.64
12.200	23.469	23.471	0.108	0.107	1.0075	5.22	0.0262	13.09

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 44-07P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	17.620	17.618	2.811	2.811	1.0110	5.68	0.0632	7.73
8.400	13.804	13.802	2.559	2.559	1.0110	5.78	0.0581	8.14
8.600	10.777	10.775	2.345	2.345	1.0110	5.76	0.0561	8.25
8.800	7.718	7.716	2.110	2.110	1.0110	5.84	0.0512	8.76
9.000	5.495	5.494	1.852	1.852	1.0110	5.91	0.0451	9.68
9.200	3.886	3.885	1.598	1.598	1.0110	5.91	0.0445	9.59
9.400	2.917	2.917	1.291	1.290	1.0110	5.92	0.0446	9.35
9.600	2.812	2.812	1.009	1.009	1.0110	5.89	0.0435	9.41
9.800	3.177	3.177	0.747	0.747	1.0110	5.89	0.0436	9.20
10.000	3.963	3.963	0.554	0.554	1.0110	5.90	0.0448	8.78
10.200	5.297	5.298	0.447	0.447	1.0110	5.86	0.0415	9.31
10.400	7.015	7.016	0.359	0.359	1.0110	5.84	0.0392	9.68
10.600	8.710	8.711	0.289	0.289	1.0110	5.83	0.0391	9.54
10.800	10.139	10.140	0.239	0.239	1.0110	5.81	0.0397	9.24
11.000	11.468	11.470	0.199	0.199	1.0110	5.78	0.0405	8.91
11.200	12.274	12.276	0.164	0.164	1.0110	5.75	0.0431	8.24
11.400	14.077	14.078	0.139	0.139	1.0110	5.71	0.0412	8.51
11.600	15.722	15.723	0.112	0.112	1.0110	5.70	0.0408	8.45
11.800	17.844	17.845	0.092	0.092	1.0110	5.66	0.0384	8.85
12.000	18.239	18.240	0.059	0.059	1.0110	5.75	0.0421	7.87
12.200	18.578	18.579	0.039	0.039	1.0110	5.76	0.0434	7.51

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A4-07PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	24.350	24.347	2.807	2.807	1.0050	5.76	0.0450	10.77
8.400	20.869	20.866	2.575	2.575	1.0050	5.74	0.0414	11.46
8.600	15.382	15.379	2.351	2.351	1.0050	5.79	0.0406	11.37
8.800	10.914	10.912	2.131	2.131	1.0050	5.83	0.0395	11.36
9.000	8.308	8.306	1.899	1.898	1.0050	5.86	0.0344	12.72
9.200	6.216	6.215	1.662	1.662	1.0050	5.86	0.0321	13.35
9.400	4.169	4.168	1.377	1.376	1.0050	5.89	0.0341	12.26
9.600	3.003	3.002	1.135	1.135	1.0050	5.84	0.0419	9.82
9.800	3.126	3.126	0.903	0.903	1.0050	5.79	0.0406	9.96
10.000	4.688	4.689	0.685	0.685	1.0050	5.79	0.0316	12.57
10.200	6.607	6.608	0.513	0.513	1.0050	5.81	0.0289	13.41
10.400	8.570	8.572	0.405	0.405	1.0050	5.80	0.0283	13.47
10.600	9.311	9.313	0.315	0.315	1.0050	5.81	0.0334	11.17
10.800	8.541	8.542	0.250	0.250	1.0050	5.81	0.0450	9.15
11.000	8.861	8.862	0.210	0.210	1.0050	5.77	0.0498	7.25
11.200	7.413	7.414	0.180	0.180	1.0050	5.68	0.0660	5.42
11.400	8.100	8.101	0.165	0.165	1.0050	5.57	0.0633	5.60
11.600	11.272	11.273	0.145	0.145	1.0050	5.52	0.0490	7.15
11.800	13.996	13.997	0.123	0.123	1.0050	5.48	0.0427	8.09
12.000	16.255	16.257	0.090	0.090	1.0050	5.54	0.0417	8.09
12.200	19.120	19.122	0.063	0.063	1.0050	5.59	0.0389	8.51

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AS A5-01PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.200	34.395	34.395	1.797	1.797	2.018	5.78	0.0317	56.90
2.300	32.211	32.212	1.367	1.367	2.018	5.72	0.0349	49.65
2.400	32.866	32.868	1.017	1.017	2.018	5.76	0.0384	43.08
2.450	42.170	42.171	0.842	0.842	2.018	5.88	0.0329	48.80
2.500	33.651	33.652	0.717	0.717	2.018	5.92	0.0439	35.75
2.600	25.556	25.557	0.527	0.527	2.018	5.98	0.0634	23.69
2.700	31.824	31.824	0.437	0.437	2.018	5.84	0.0513	28.49
2.800	34.674	34.675	0.272	0.272	2.018	6.05	0.0524	26.48
2.900	34.814	34.814	0.187	0.187	2.018	6.01	0.0532	25.26
3.000	27.797	27.797	0.112	0.112	2.018	5.96	0.0672	19.41
3.100	29.785	29.785	0.032	0.032	2.018	5.99	0.0630	19.97
3.200	24.903	24.903	6.127	6.127	2.018	5.97	0.0741	16.49
3.300	13.536	13.536	5.909	5.809	2.018	5.59	0.1317	9.31
3.400	21.135	21.135	5.492	5.492	2.018	5.51	0.0803	14.90
3.500	23.308	23.307	5.164	5.164	2.018	5.63	0.0692	16.62
3.600	28.314	29.313	4.891	4.891	2.018	5.58	0.0531	21.12
3.700	35.563	35.562	4.614	4.613	2.018	5.65	0.0379	28.62
3.800	34.455	34.453	4.334	4.334	2.018	5.79	0.0329	31.73
3.900	27.305	27.303	4.084	4.084	2.018	5.83	0.0346	29.26
4.000	20.678	20.675	3.848	3.848	2.018	5.82	0.0377	26.23

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A5-02B

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	20.845	20.843	2.830	2.830	1.0050	5.61	0.0578	8.50
8.400	16.293	16.290	2.565	2.565	1.0050	5.81	0.0506	9.32
8.600	14.158	14.155	2.346	2.346	1.0050	5.81	0.0431	10.69
8.800	10.233	10.231	2.115	2.116	1.0050	5.87	0.0398	11.24
9.000	7.328	7.327	1.891	1.891	1.0050	5.89	0.0381	11.48
9.200	5.321	5.320	1.664	1.664	1.0050	5.87	0.0374	11.44
9.400	3.811	3.810	1.387	1.385	1.0050	5.88	0.0377	11.09
9.600	3.199	3.199	1.134	1.134	1.0050	5.84	0.0393	10.47
9.800	3.385	3.385	0.865	0.865	1.0050	5.83	0.0379	10.63
10.000	4.050	4.051	0.645	0.645	1.0050	5.83	0.0382	10.35
10.200	5.200	5.201	0.500	0.500	1.0050	5.82	0.0376	10.32
10.400	6.683	6.685	0.395	0.395	1.0050	5.81	0.0371	10.27
10.600	8.100	8.102	0.325	0.325	1.0050	5.78	0.0371	10.09
10.800	9.462	9.464	0.270	0.270	1.0050	5.74	0.0377	9.77
11.000	11.003	11.004	0.225	0.225	1.0050	5.71	0.0379	9.58
11.200	12.546	12.547	0.185	0.185	1.0050	5.70	0.0385	9.26
11.400	14.706	14.708	0.155	0.155	1.0050	5.67	0.0368	9.56
11.600	16.406	16.407	0.123	0.123	1.0050	5.68	0.0373	9.26
11.800	18.093	18.094	0.103	0.103	1.0050	5.64	0.0362	9.41
12.000	19.120	19.122	0.070	0.070	1.0050	5.72	0.0386	8.61
12.200	20.725	20.726	0.045	0.045	1.0050	5.76	0.0383	8.50

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 45-02PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATIO DEPTH CM
8.200	30.199	30.197	2.854	2.854	1.0060	5.42	0.0437	11.46
8.400	27.925	27.922	2.624	2.624	1.0060	5.43	0.0381	12.78
8.600	25.119	25.115	2.415	2.415	1.0060	5.46	0.0329	14.45
8.800	19.098	19.095	2.210	2.210	1.0060	5.52	0.0313	14.77
9.000	14.538	14.535	2.002	2.002	1.0060	5.58	0.0282	15.93
9.200	10.877	10.875	1.811	1.811	1.0060	5.56	0.0276	15.97
9.400	7.852	7.851	1.594	1.593	1.0060	5.57	0.0268	16.04
9.600	5.656	5.655	1.363	1.363	1.0060	5.57	0.0279	15.09
9.800	4.875	4.875	1.101	1.101	1.0060	5.57	0.0270	15.30
10.000	4.898	4.898	0.864	0.864	1.0060	5.57	0.0269	15.05
10.200	5.655	5.657	0.682	0.682	1.0060	5.54	0.0264	15.04
10.400	7.015	7.016	0.534	0.534	1.0060	5.53	0.0261	14.97
10.600	8.511	8.513	0.414	0.414	1.0060	5.55	0.0274	13.93
10.800	10.292	10.294	0.294	0.294	1.0060	5.66	0.0319	11.64
11.000	12.882	12.884	0.292	0.292	1.0060	5.46	0.0253	14.69
11.200	15.066	15.068	0.244	0.244	1.0060	5.43	0.0252	14.48
11.400	18.134	18.136	0.094	0.094	1.0060	6.10	0.0394	8.60
11.600	20.394	20.396	0.159	0.159	1.0060	5.45	0.0255	13.81
11.800	24.071	24.074	0.134	0.134	1.0060	5.42	0.0237	14.69
12.000	25.061	25.063	0.094	0.094	1.0060	5.51	0.0266	12.74
12.200	27.829	27.831	0.074	0.074	1.0060	5.49	0.0255	13.09

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. 4X 45-03P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	15.150	15.133	2.782	2.782	1.0050	5.94	0.0648	7.37
8.400	12.092	12.090	2.535	2.535	1.0050	5.98	0.0594	7.93
8.600	8.923	8.921	2.301	2.301	1.0050	6.01	0.0560	8.09
8.800	6.166	6.165	2.051	2.051	1.0050	6.08	0.0516	8.53
9.000	4.290	4.289	1.778	1.778	1.0050	6.12	0.0472	9.08
9.200	3.206	3.206	1.494	1.494	1.0050	6.11	0.0452	9.28
9.400	2.600	2.600	1.168	1.168	1.0050	6.11	0.0462	8.90
9.600	2.695	2.695	0.875	0.875	1.0050	6.08	0.0464	8.68
9.800	3.126	3.127	0.648	0.648	1.0050	6.07	0.0489	8.08
10.000	3.926	3.927	0.510	0.510	1.0050	6.03	0.0487	7.99
10.200	5.164	5.165	0.403	0.403	1.0050	6.01	0.0473	8.07
10.400	6.660	6.661	0.325	0.325	1.0050	5.99	0.0457	8.20
10.600	7.700	7.701	0.275	0.275	1.0050	5.93	0.0463	7.99
10.800	8.750	8.751	0.240	0.240	1.0050	5.85	0.0457	8.00
11.000	10.471	10.472	0.193	0.193	1.0050	5.86	0.0455	7.88
11.200	12.064	12.065	0.160	0.160	1.0050	5.84	0.0447	7.89
11.400	12.618	12.619	0.135	0.135	1.0050	5.79	0.0469	7.43
11.600	12.677	12.677	0.100	0.100	1.0050	5.84	0.0536	6.36
11.800	13.756	13.757	0.085	0.085	1.0050	5.76	0.0516	6.53
12.000	14.825	14.826	0.060	0.060	1.0050	5.80	0.0520	6.36
12.200	15.258	15.259	0.040	0.040	1.0050	5.80	0.0531	6.12

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 45-03PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATIO DEPTH CM
8.200	23.523	23.520	2.804	2.804	1.0110	5.71	0.0460	10.59
8.400	18.858	18.855	2.569	2.569	1.0110	5.71	0.0446	10.66
8.600	14.672	14.670	2.355	2.355	1.0110	5.70	0.0433	10.73
8.800	10.902	10.900	2.125	2.125	1.0110	5.78	0.0389	11.61
9.000	8.008	8.006	1.892	1.892	1.0110	5.81	0.0352	12.49
9.200	5.495	5.494	1.651	1.651	1.0110	5.82	0.0355	12.12
9.400	3.532	3.531	1.361	1.360	1.0110	5.85	0.0396	10.60
9.600	2.477	2.477	1.163	1.163	1.0110	5.75	0.0518	8.01
9.800	2.455	2.455	0.902	0.902	1.0110	5.72	0.0521	7.81
10.000	3.319	3.319	0.689	0.689	1.0110	5.71	0.0444	9.00
10.200	4.202	4.203	0.522	0.522	1.0110	5.71	0.0445	8.81
10.400	5.123	5.124	0.429	0.429	1.0110	5.66	0.0442	8.73
10.600	6.855	6.856	0.349	0.349	1.0110	5.64	0.0406	9.33
10.800	7.718	7.719	0.274	0.274	1.0110	5.66	0.0455	8.17
11.000	7.745	7.746	0.239	0.239	1.0110	5.58	0.0506	7.26
11.200	8.580	8.581	0.209	0.209	1.0110	5.51	0.0506	7.18
11.400	13.274	13.275	0.179	0.179	1.0110	5.48	0.0366	9.78
11.600	17.298	17.300	0.139	0.139	1.0110	5.52	0.0328	10.67
11.800	20.606	20.608	0.114	0.114	1.0110	5.50	0.0302	11.43
12.000	19.165	19.166	0.084	0.084	1.0110	5.54	0.0362	9.34
12.200	21.702	21.703	0.069	0.069	1.0110	5.48	0.0333	10.05

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A5-04P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	20.464	20.462	2.807	2.807	1.0000	5.83	0.0536	9.00
8.400	18.274	18.272	2.570	2.570	1.0000	5.84	0.0517	9.09
8.600	14.371	14.369	2.386	2.386	1.0000	5.69	0.0503	9.25
8.800	9.977	9.975	2.126	2.126	1.0000	5.91	0.0422	10.58
9.000	6.180	6.179	1.893	1.893	1.0000	5.95	0.0448	9.70
9.200	4.256	4.255	1.697	1.697	1.0000	5.89	0.0495	8.63
9.400	2.901	2.900	1.422	1.421	1.0000	5.92	0.0511	8.17
9.600	2.139	2.138	1.145	1.145	1.0000	5.89	0.0588	6.96
9.800	1.758	1.758	0.753	0.753	1.0000	5.93	0.0769	5.20
10.000	1.429	1.429	0.590	0.590	1.0000	5.73	0.1060	3.76
10.200	2.018	2.019	0.585	0.585	1.0000	5.63	0.0802	4.92
10.400	2.483	2.484	0.500	0.500	1.0000	5.55	0.0751	5.19
10.600	3.824	3.824	0.390	0.390	1.0000	5.59	0.0631	6.04
10.800	4.870	4.870	0.310	0.310	1.0000	5.60	0.0624	5.99
11.000	5.546	5.547	0.270	0.270	1.0000	5.53	0.0621	5.94
11.200	8.337	8.338	0.225	0.225	1.0000	5.54	0.0488	7.43
11.400	10.447	10.448	0.170	0.170	1.0000	5.62	0.0483	7.32
11.600	12.218	12.219	0.130	0.130	1.0000	5.67	0.0485	7.12
11.800	13.788	13.789	0.115	0.115	1.0000	5.59	0.0451	7.59
12.000	15.293	15.294	0.080	0.080	1.0000	5.67	0.0465	7.18
12.200	16.181	16.182	0.058	0.058	1.0000	5.68	0.0471	6.97

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. 4X 15-04PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	27.701	27.699	2.865	2.865	1.0000	5.40	0.0496	10.09
8.400	24.182	24.180	2.645	2.645	1.0000	5.36	0.0480	10.23
8.600	23.523	23.520	2.446	2.446	1.0000	5.36	0.0400	11.98
8.800	17.298	17.295	2.226	2.226	1.0000	5.52	0.0368	12.55
9.000	11.375	11.374	2.023	2.023	1.0000	5.59	0.0386	11.61
9.200	8.463	8.461	1.834	1.834	1.0000	5.58	0.0377	11.66
9.400	5.495	5.494	1.632	1.631	1.0000	5.59	0.0413	10.40
9.600	4.074	4.073	1.419	1.419	1.0000	5.57	0.0419	10.06
9.800	3.162	3.162	1.147	1.147	1.0000	5.60	0.0426	9.66
10.000	2.636	2.636	0.900	0.900	1.0000	5.58	0.0496	8.15
10.200	2.884	2.884	0.733	0.733	1.0000	5.52	0.0493	8.08
10.400	3.412	3.412	0.580	0.580	1.0000	5.49	0.0491	7.98
10.600	4.954	4.955	0.470	0.470	1.0000	5.47	0.0410	9.39
10.800	7.079	7.081	0.383	0.383	1.0000	5.45	0.0351	10.78
11.000	8.690	8.691	0.310	0.310	1.0000	5.45	0.0351	10.60
11.200	10.328	10.329	0.245	0.245	1.0000	5.47	0.0365	9.97
11.400	8.810	8.811	0.200	0.200	1.0000	5.46	0.0502	7.15
11.600	11.156	11.157	0.180	0.180	1.0000	5.38	0.0424	8.36
11.800	15.849	15.850	0.155	0.155	1.0000	5.34	0.0327	10.69
12.000	18.750	18.751	0.110	0.110	1.0000	5.45	0.0332	10.26
12.200	17.378	17.379	0.090	0.090	1.0000	5.41	0.0383	8.77

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A5-05D

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATIO DEPTH CM
8.200	17.701	17.698	2.762	2.762	1.0000	6.11	0.0508	9.27
8.400	13.646	13.643	2.507	2.507	1.0000	6.15	0.0467	9.80
8.600	9.277	9.277	2.266	2.266	1.0000	6.18	0.0470	9.60
8.800	6.252	6.250	2.026	2.026	1.0000	6.19	0.0470	9.28
9.000	4.803	4.802	1.783	1.783	1.0000	6.16	0.0428	9.98
9.200	3.981	3.980	1.522	1.522	1.0000	6.12	0.0380	11.02
9.400	3.311	3.311	1.208	1.208	1.0000	6.12	0.0368	11.15
9.600	3.424	3.424	0.920	0.920	1.0000	6.10	0.0358	11.25
9.800	4.018	4.019	0.683	0.683	1.0000	6.10	0.0366	10.78
10.000	5.093	5.094	0.520	0.520	1.0000	6.08	0.0371	10.43
10.200	6.331	6.333	0.408	0.408	1.0000	6.07	0.0383	9.93
10.400	7.354	7.355	0.330	0.330	1.0000	6.04	0.0408	9.15
10.600	7.096	7.097	0.270	0.270	1.0000	5.99	0.0509	7.22
10.800	7.568	7.569	0.235	0.235	1.0000	5.91	0.0536	6.78
11.000	9.705	9.706	0.195	0.195	1.0000	5.89	0.0486	7.35
11.200	10.351	10.352	0.175	0.175	1.0000	5.79	0.0487	7.27
11.400	12.912	12.913	0.140	0.140	1.0000	5.81	0.0449	7.75
11.600	15.560	15.561	0.115	0.115	1.0000	5.79	0.0409	8.37
11.800	17.989	17.990	0.095	0.095	1.0000	5.75	0.0379	8.91
12.000	17.783	17.784	0.065	0.065	1.0000	5.81	0.0426	7.75
12.200	18.836	18.837	0.040	0.040	1.0000	5.86	0.0431	7.49

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A5-05PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	32.961	32.958	2.884	2.884	1.0125	5.12	0.0440	11.71
8.400	29.376	29.373	2.645	2.645	1.0125	5.23	0.0392	12.67
8.600	27.353	27.349	2.439	2.438	1.0125	5.26	0.0334	14.50
8.800	20.989	20.986	2.233	2.233	1.0125	5.35	0.0315	14.89
9.000	13.646	13.643	2.010	2.010	1.0125	5.48	0.0311	14.57
9.200	10.023	10.021	1.821	1.821	1.0125	5.47	0.0310	14.31
9.400	6.918	6.917	1.609	1.609	1.0125	5.48	0.0317	13.70
9.600	5.152	5.151	1.381	1.381	1.0125	5.48	0.0317	13.41
9.800	4.375	4.375	1.126	1.126	1.0125	5.48	0.0307	13.54
10.000	4.721	4.721	0.892	0.892	1.0125	5.47	0.0279	14.63
10.200	5.984	5.985	0.686	0.685	1.0125	5.48	0.0250	15.99
10.400	7.943	7.945	0.523	0.527	1.0125	5.49	0.0234	16.75
10.600	10.000	10.002	0.418	0.417	1.0125	5.48	0.0233	16.53
10.800	11.749	11.751	0.333	0.332	1.0125	5.48	0.0247	15.26
11.000	13.804	13.806	0.273	0.272	1.0125	5.47	0.0253	14.67
11.200	13.884	13.885	0.226	0.225	1.0125	5.45	0.0294	12.40
11.400	17.179	17.181	0.177	0.177	1.0125	5.48	0.0285	12.56
11.600	19.770	19.771	0.148	0.147	1.0125	5.46	0.0276	12.74
11.800	22.830	22.832	0.118	0.117	1.0125	5.46	0.0268	12.92
12.000	22.233	22.234	0.088	0.087	1.0125	5.50	0.0307	11.05
12.200	23.851	23.852	0.068	0.067	1.0125	5.48	0.0304	10.99

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A5-05P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATIC DEPTH CM
8.200	18.838	18.834	2.793	2.793	1.0090	5.81	0.0548	8.81
8.400	15.740	15.737	2.551	2.551	1.0090	5.83	0.0493	9.55
8.600	11.722	11.720	2.327	2.327	1.0090	5.85	0.0480	9.57
8.800	8.492	8.490	2.082	2.082	1.0090	5.93	0.0424	10.50
9.000	6.012	6.010	1.854	1.854	1.0090	5.92	0.0416	10.48
9.200	4.365	4.364	1.603	1.603	1.0090	5.92	0.0402	10.62
9.400	3.311	3.311	1.303	1.302	1.0090	5.93	0.0397	10.50
9.600	3.087	3.087	1.031	1.031	1.0090	5.89	0.0396	10.34
9.800	3.528	3.528	0.754	0.754	1.0090	5.91	0.0390	10.27
10.000	4.431	4.432	0.571	0.571	1.0090	5.90	0.0390	10.08
10.200	5.508	5.509	0.441	0.441	1.0090	5.89	0.0405	9.52
10.400	6.761	6.762	0.351	0.351	1.0090	5.88	0.0416	9.09
10.600	7.727	7.728	0.291	0.291	1.0090	5.84	0.0436	8.55
10.800	9.047	9.048	0.234	0.234	1.0090	5.84	0.0453	8.08
11.000	9.683	9.684	0.206	0.206	1.0090	5.75	0.0465	7.79
11.200	11.912	11.914	0.171	0.171	1.0090	5.73	0.0431	8.26
11.400	14.471	14.472	0.131	0.131	1.0090	5.78	0.0416	8.37
11.600	16.032	16.034	0.109	0.109	1.0090	5.74	0.0406	8.46
11.800	17.783	17.784	0.091	0.091	1.0090	5.69	0.0388	8.75
12.000	17.681	17.681	0.056	0.056	1.0090	5.80	0.0441	7.50
12.200	18.815	18.815	0.031	0.031	1.0090	5.86	0.0440	7.34

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A5-06PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	27.893	27.891	2.840	2.840	1.0100	5.47	0.0448	11.10
8.400	24.016	24.013	2.600	2.600	1.0100	5.54	0.0401	12.04
8.600	20.114	20.111	2.386	2.386	1.0100	5.57	0.0362	12.99
8.800	14.355	14.352	2.166	2.166	1.0100	5.65	0.0347	13.15
9.000	11.015	11.013	1.953	1.953	1.0100	5.67	0.0313	14.24
9.200	8.119	8.117	1.747	1.747	1.0100	5.65	0.0306	14.27
9.400	5.623	5.622	1.512	1.511	1.0100	5.66	0.0315	13.57
9.600	4.305	4.305	1.264	1.264	1.0100	5.65	0.0324	12.91
9.800	3.882	3.881	1.013	1.013	1.0100	5.63	0.0328	12.51
10.000	4.395	4.396	0.780	0.780	1.0100	5.62	0.0312	12.91
10.200	5.610	5.611	0.608	0.608	1.0100	5.61	0.0292	13.55
10.400	7.379	7.380	0.475	0.475	1.0100	5.60	0.0278	13.93
10.600	8.882	8.883	0.380	0.380	1.0100	5.59	0.0288	13.21
10.800	10.447	10.449	0.315	0.315	1.0100	5.55	0.0293	12.78
11.000	11.803	11.805	0.250	0.250	1.0100	5.57	0.0321	11.46
11.200	14.622	14.623	0.215	0.215	1.0100	5.52	0.0292	12.44
11.400	16.749	16.751	0.170	0.170	1.0100	5.54	0.0302	11.78
11.600	19.076	19.078	0.140	0.140	1.0100	5.53	0.0296	11.81
11.800	22.080	22.082	0.120	0.120	1.0100	5.47	0.0274	12.61
12.000	21.677	21.678	0.085	0.085	1.0100	5.54	0.0319	10.60
12.200	23.147	23.148	0.060	0.060	1.0100	5.57	0.0323	10.25

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A5-07P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATIO DEPTH CM
8.200	20.606	20.603	2.790	2.790	1.0000	5.93	0.0495	9.66
8.400	16.904	16.902	2.545	2.545	1.0000	5.96	0.0447	10.42
8.600	13.032	13.029	2.326	2.326	1.0000	5.95	0.0429	10.60
8.800	9.063	9.066	2.081	2.081	1.0000	6.04	0.0394	11.20
9.000	6.095	6.094	1.833	1.833	1.0000	6.06	0.0385	11.17
9.200	4.111	4.111	1.587	1.587	1.0000	6.04	0.0410	10.70
9.400	3.273	3.273	1.312	1.311	1.0000	6.02	0.0402	10.29
9.600	3.023	3.023	1.060	1.060	1.0000	5.96	0.0403	10.09
9.800	3.408	3.408	0.778	0.778	1.0000	5.98	0.0394	10.12
10.000	4.325	4.326	0.570	0.570	1.0000	5.99	0.0398	9.80
10.200	5.012	5.013	0.443	0.443	1.0000	5.98	0.0439	8.71
10.400	5.123	5.124	0.355	0.355	1.0000	5.93	0.0535	7.04
10.600	4.781	4.782	0.290	0.290	1.0000	5.87	0.0689	5.39
10.800	5.140	5.141	0.290	0.290	1.0000	5.67	0.0633	5.86
11.000	8.413	8.415	0.255	0.255	1.0000	5.63	0.0439	8.34
11.200	11.749	11.750	0.205	0.205	1.0000	5.65	0.0378	9.50
11.400	14.256	14.258	0.160	0.160	1.0000	5.69	0.0371	9.46
11.600	15.904	15.905	0.135	0.135	1.0000	5.65	0.0365	9.49
11.800	18.578	18.579	0.110	0.110	1.0000	5.63	0.0343	9.95
12.000	19.011	19.012	0.075	0.075	1.0000	5.72	0.0382	8.70
12.200	20.536	20.536	0.058	0.058	1.0000	5.69	0.0370	8.85

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 15-07PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATIO DEPTH CM
8.200	30.061	30.058	2.857	2.857	1.0075	5.37	0.0444	11.32
8.400	26.454	26.452	2.618	2.618	1.0075	5.46	0.0392	12.41
8.600	22.207	22.204	2.418	2.418	1.0075	5.43	0.0377	12.63
8.800	16.749	16.747	2.198	2.198	1.0075	5.55	0.0340	13.56
9.000	12.064	12.062	1.995	1.995	1.0075	5.58	0.0331	13.56
9.200	9.550	9.548	1.804	1.804	1.0075	5.56	0.0307	14.32
9.400	6.974	6.973	1.594	1.594	1.0075	5.56	0.0302	14.27
9.600	5.309	5.308	1.351	1.351	1.0075	5.57	0.0293	14.40
9.800	4.721	4.720	1.071	1.071	1.0075	5.59	0.0275	15.00
10.000	4.853	4.853	0.843	0.842	1.0075	5.58	0.0273	14.79
10.200	5.495	5.496	0.653	0.652	1.0075	5.57	0.0281	14.12
10.400	6.457	6.458	0.513	0.512	1.0075	5.55	0.0294	13.23
10.600	7.621	7.622	0.423	0.422	1.0075	5.51	0.0300	12.79
10.800	9.141	9.143	0.340	0.340	1.0075	5.50	0.0309	12.20
11.000	11.259	11.261	0.288	0.287	1.0075	5.46	0.0293	12.66
11.200	13.772	13.774	0.239	0.237	1.0075	5.44	0.0283	12.90
11.400	15.885	15.887	0.182	0.182	1.0075	5.50	0.0301	11.84
11.600	18.134	18.136	0.158	0.157	1.0075	5.45	0.0289	12.22
11.800	21.478	21.480	0.138	0.137	1.0075	5.38	0.0261	13.37
12.000	22.080	22.082	0.097	0.097	1.0075	5.47	0.0297	11.45
12.200	24.350	24.351	0.073	0.072	1.0075	5.49	0.0293	11.40

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX AS-C1

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATIO DEPTH CM
8.200	5.585	5.584	2.442	2.442	1.3950	3.86	0.0597	9.92
8.400	3.972	3.971	2.012	2.012	1.3950	3.94	0.0491	11.66
8.600	2.570	2.570	1.476	1.475	1.3950	4.03	0.0513	10.78
8.800	2.042	2.042	0.900	0.900	1.3950	4.11	0.0705	7.59
9.000	1.679	1.679	0.405	0.405	1.3950	4.04	0.1396	3.77
9.200	1.090	1.090	0.720	0.720	1.3950	3.65	0.1424	3.82
9.400	1.862	1.862	0.735	0.735	1.3950	3.64	0.0903	5.89
9.600	3.631	3.631	0.575	0.575	1.3950	3.68	0.0567	9.15
9.800	5.835	5.835	0.405	0.405	1.3950	3.76	0.0482	10.44
10.000	7.971	7.972	0.305	0.305	1.3950	3.79	0.0445	11.01
10.200	9.874	9.875	0.230	0.230	1.3950	3.82	0.0437	10.96
10.400	10.046	10.047	0.123	0.123	1.3950	4.01	0.0585	7.83
10.600	8.933	8.934	0.115	0.115	1.3950	3.89	0.0656	6.96
10.800	6.368	6.368	0.080	0.080	1.3950	3.85	0.1001	4.50
11.000	5.935	5.936	0.098	0.098	1.3950	3.64	0.0989	4.60
11.200	9.110	9.110	0.078	0.078	1.3950	3.63	0.0661	6.77
11.400	13.228	13.229	0.045	0.045	1.3950	3.66	0.0478	9.16
11.600	14.125	14.125	0.003	0.003	1.3950	3.73	0.0466	9.14
11.800	10.777	10.777	1.498	1.498	1.3950	3.77	0.0608	6.85
12.000	8.289	8.289	1.447	1.447	1.3950	3.72	0.0776	5.32
12.200	10.375	10.375	1.392	1.392	1.3950	3.70	0.0585	6.96

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A5-C2

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	7.907	7.905	2.502	2.502	1.3900	3.78	0.0502	11.93
8.400	5.012	5.011	2.132	2.132	1.3900	3.85	0.0487	11.88
8.600	2.738	2.738	1.681	1.680	1.3900	3.94	0.0557	10.04
8.800	1.413	1.413	1.065	1.065	1.3900	4.02	0.0954	5.68
9.000	1.303	1.303	1.833	1.833	1.3900	3.63	0.1486	3.76
9.200	2.042	2.042	1.134	1.134	1.3900	3.62	0.0714	7.64
9.400	2.835	2.835	0.805	0.805	1.3900	3.66	0.0567	9.36
9.600	4.550	4.550	0.600	0.600	1.3900	3.69	0.0438	11.82
9.800	6.457	6.457	0.440	0.440	1.3900	3.73	0.0404	12.48
10.000	8.730	8.731	0.340	0.340	1.3900	3.75	0.0371	13.29
10.200	10.814	10.815	0.260	0.260	1.3900	3.77	0.0365	13.19
10.400	12.633	12.634	0.203	0.203	1.3900	3.78	0.0362	13.03
10.600	14.060	14.062	0.150	0.150	1.3900	3.80	0.0374	12.33
10.800	14.723	14.724	0.105	0.105	1.3900	3.83	0.0399	11.31
11.000	14.158	14.158	0.068	0.068	1.3900	3.85	0.0448	9.88
11.200	11.092	11.092	0.043	0.043	1.3900	3.82	0.0592	7.37
11.400	10.399	10.399	0.033	0.033	1.3900	3.73	0.0628	6.90
11.600	15.578	15.578	0.005	0.005	1.3900	3.75	0.0423	10.06
11.800	16.982	16.982	1.503	1.503	1.3900	3.77	0.0384	10.85
12.000	16.672	16.672	1.442	1.442	1.3900	3.77	0.0377	10.87
12.200	16.106	16.106	1.377	1.377	1.3900	3.79	0.0364	11.04

DIELECTRIC PROPERTIES OF OIL SHALL

SAMPLE NO. AS A5-C3

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.200	28.642	28.642	1.505	1.505	3.055	3.52	0.0420	55.08
2.300	27.461	27.462	1.170	1.170	3.055	3.44	0.0406	55.11
2.400	28.907	28.908	0.820	0.820	3.055	3.47	0.0420	50.81
2.450	29.894	29.895	0.685	0.685	3.055	3.47	0.0420	49.81
2.500	30.514	30.515	0.530	0.530	3.055	3.53	0.0434	46.84
2.600	30.620	30.620	0.330	0.330	3.055	3.55	0.0451	43.28
12.700	30.026	30.026	0.195	0.195	3.055	3.51	0.0459	41.12
2.800	31.842	31.842	0.015	0.015	3.055	3.59	0.0441	40.78
2.900	32.359	32.359	7.305	7.305	3.055	3.58	0.0420	41.42
3.000	29.512	29.511	6.703	6.703	3.055	3.59	0.0435	38.65
3.100	28.907	28.906	6.191	6.191	3.055	3.56	0.0408	39.96
3.200	26.546	26.545	5.715	5.715	3.055	3.57	0.0394	40.01
3.300	18.685	18.684	5.312	5.312	3.055	3.52	0.0497	31.03
3.400	15.794	15.793	4.935	4.935	3.055	3.49	0.0508	29.61
3.500	13.335	13.334	4.537	4.537	3.055	3.51	0.0483	30.16
3.600	12.218	12.217	4.204	4.204	3.055	3.46	0.0443	32.20
3.700	10.927	10.926	3.827	3.826	3.055	3.46	0.0386	35.89
3.800	9.016	9.015	3.427	3.426	3.055	3.47	0.0359	37.59
3.900	4.400	4.400	3.027	3.027	3.055	3.47	0.0580	22.64
4.000	6.026	6.025	2.591	2.591	3.055	3.46	0.0351	36.51

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AS A5-C4

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.200	28.022	28.022	1.495	1.495	2.935	3.70	0.0440	51.28
2.300	25.469	25.469	1.110	1.110	2.935	3.67	0.0474	45.73
2.400	26.243	26.243	0.830	0.830	2.935	3.64	0.0473	44.07
2.450	26.394	26.394	0.665	0.665	2.935	3.69	0.0498	40.73
2.500	25.410	25.410	0.540	0.540	2.935	3.71	0.0536	36.96
2.600	24.975	24.975	0.350	0.350	2.935	3.72	0.0568	33.51
2.700	26.092	26.092	0.235	0.235	2.935	3.65	0.0539	34.33
2.800	29.785	29.785	0.055	0.055	2.935	3.75	0.0487	36.14
2.900	29.957	29.957	7.355	7.355	2.935	3.73	0.0472	36.14
3.000	27.829	27.829	6.753	6.753	2.935	3.75	0.0486	33.84
3.100	26.151	26.151	6.221	6.221	2.935	3.78	0.0477	33.18
3.200	20.844	20.844	5.765	5.765	2.935	3.76	0.0540	28.48
3.300	15.903	15.903	5.372	5.372	2.935	3.71	0.0635	23.69
3.400	14.076	14.076	5.005	5.005	2.935	3.66	0.0627	23.41
3.500	12.487	12.487	4.627	4.627	2.935	3.68	0.0579	24.54
3.600	11.180	11.180	4.284	4.284	2.935	3.65	0.0533	26.05
3.700	10.398	10.398	3.947	3.946	2.935	3.63	0.0463	29.22
3.800	8.932	8.932	3.537	3.537	2.935	3.67	0.0397	33.04
3.900	6.917	6.917	3.147	3.147	2.935	3.66	0.0399	32.05
4.000	5.610	5.610	2.751	2.751	2.935	3.65	0.0401	31.14

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AU A5-C5

FREQUENCY MHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
100.00	100.000	100.000	144.586	144.586	5.309	1.23	0.0000	0.00
150.00	100.000	100.000	94.151	94.151	5.309	9.73	0.0000	0.00
200.00	100.000	100.000	69.329	69.329	5.309	4.36	0.0000	0.00
250.00	100.000	100.000	54.109	54.109	5.309	4.59	0.0000	0.00
300.00	100.000	100.000	44.156	44.156	5.309	3.34	0.0000	0.00
350.00	60.000	59.998	36.691	36.691	5.309	3.72	0.1682	84.32
400.00	73.000	74.998	31.135	31.135	5.309	3.52	0.0902	141.22
450.00	80.000	79.998	26.621	26.621	5.309	3.54	0.0535	210.64
500.00	58.000	57.999	22.800	22.800	5.309	3.63	0.0465	215.37
400.00	56.800	56.798	30.945	30.945	5.309	3.89	0.1010	119.99
450.00	55.000	54.998	26.471	26.471	5.309	3.75	0.0701	156.28
500.00	38.000	37.998	22.881	22.881	5.309	3.55	0.0742	136.62
550.00	28.000	27.999	19.571	19.571	5.309	3.64	0.0655	138.93
600.00	21.500	21.499	16.834	16.834	5.309	3.57	0.0630	133.71
650.00	16.200	16.199	14.381	14.381	5.309	3.52	0.0637	122.85
700.00	13.200	13.200	12.081	12.081	5.309	3.53	0.0612	118.65
750.00	11.900	11.900	10.061	10.061	5.309	3.52	0.0574	118.17
800.00	11.200	11.200	8.251	8.251	5.309	3.53	0.0551	115.42
850.00	11.180	11.180	6.641	6.641	5.309	3.56	0.0531	112.11
900.00	11.200	11.200	5.391	5.391	5.309	3.55	0.0542	103.93
915.00	11.400	11.400	5.091	5.091	5.309	3.53	0.0539	102.95
950.00	10.900	10.900	4.501	4.501	5.309	3.48	0.0583	92.39
1000.00	9.500	9.500	3.881	3.881	5.309	3.37	0.0700	74.33
1100.00	12.000	12.000	2.661	2.661	5.309	3.31	0.0632	75.45
1200.00	12.600	12.600	1.671	1.671	5.309	3.36	0.0710	61.13

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. 4X 46-01P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	27.133	27.132	2.963	2.963	1.0120	4.50	0.0617	8.90
8.400	24.547	24.546	2.738	2.738	1.0120	4.55	0.0615	8.66
8.600	22.542	22.541	2.542	2.542	1.0120	4.60	0.0588	8.81
8.800	18.155	18.153	2.359	2.359	1.0120	4.68	0.0608	8.24
9.000	14.240	14.238	2.201	2.201	1.0120	4.70	0.0650	7.54
9.200	12.560	12.559	2.010	2.010	1.0120	4.89	0.0502	9.35
9.400	10.000	9.999	1.908	1.908	1.0120	4.72	0.0594	7.86
9.600	6.546	6.545	1.767	1.767	1.0120	4.75	0.0700	6.52
9.800	4.550	4.549	1.620	1.620	1.0120	4.78	0.0751	5.94
10.000	4.111	4.111	1.499	1.499	1.0120	4.70	0.0697	6.32
10.200	3.886	3.885	1.330	1.330	1.0120	4.71	0.0558	7.73
10.400	3.256	3.254	1.141	1.140	1.0120	4.72	0.0524	8.06
10.600	2.914	2.914	0.918	0.918	1.0120	4.76	0.0508	8.13
10.800	2.658	2.658	0.745	0.745	1.0120	4.75	0.0567	7.16
11.000	2.831	2.832	0.628	0.628	1.0120	4.69	0.0575	6.97
11.200	3.631	3.631	0.508	0.508	1.0120	4.69	0.0518	7.60
11.400	4.340	4.341	0.418	0.418	1.0120	4.68	0.0509	7.60
11.600	4.925	4.927	0.353	0.353	1.0120	4.65	0.0520	7.34
11.800	6.382	6.383	0.308	0.308	1.0120	4.61	0.0453	8.31
12.000	8.251	8.252	0.248	0.248	1.0120	4.64	0.0422	8.75
12.200	9.920	9.921	0.208	0.208	1.0120	4.64	0.0402	9.04

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A6-01PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	19.655	19.655	2.953	2.953	1.0120	4.57	0.0851	6.40
8.400	31.171	31.170	2.730	2.730	1.0120	4.61	0.0476	11.11
8.600	29.343	29.341	2.544	2.544	1.0120	4.58	0.0453	11.45
8.800	23.714	23.711	2.349	2.349	1.0120	4.74	0.0448	11.11
9.000	14.126	14.124	2.171	2.171	1.0120	4.86	0.0578	8.32
9.200	10.990	10.989	2.065	2.065	1.0120	4.65	0.0723	6.66
9.400	11.803	11.802	1.908	1.908	1.0120	4.71	0.0505	9.26
9.600	7.047	7.046	1.438	1.438	1.0120	5.40	0.0256	16.68
9.800	3.967	3.967	1.670	1.670	1.0120	4.69	0.1006	4.47
10.000	5.483	5.482	1.519	1.519	1.0120	4.63	0.0567	7.82
10.200	3.882	3.881	1.305	1.305	1.0120	4.74	0.0530	8.11
10.400	1.759	1.758	1.031	1.030	1.0120	4.89	0.0854	4.87
10.600	1.294	1.294	1.608	1.608	1.0120	4.67	0.1960	2.14
10.800	2.320	2.320	1.335	1.335	1.0120	4.06	0.1341	3.28
11.000	2.720	2.719	1.051	1.051	1.0120	4.20	0.0695	6.09
11.200	2.780	2.780	0.909	0.909	1.0120	4.19	0.0610	6.83
11.400	4.710	4.710	0.651	0.651	1.0120	4.33	0.0349	11.53
11.600	6.166	6.166	0.551	0.551	1.0120	4.31	0.0291	13.63
11.800	7.674	7.674	0.453	0.453	1.0120	4.31	0.0269	14.50
12.000	9.069	9.069	0.348	0.348	1.0120	4.37	0.0283	13.42
12.200	9.366	9.366	0.278	0.278	1.0120	4.40	0.0332	11.23

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A6-02P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	27.829	27.828	2.989	2.989	1.0110	4.31	0.0606	9.26
8.400	25.882	25.881	2.779	2.779	1.0110	4.25	0.0609	9.05
8.600	25.235	25.234	2.585	2.585	1.0110	4.29	0.0573	9.36
8.800	22.594	22.593	2.400	2.400	1.0110	4.42	0.0555	9.31
9.000	18.989	18.987	2.237	2.237	1.0110	4.48	0.0558	8.98
9.200	17.100	17.098	2.091	2.091	1.0110	4.50	0.0518	9.44
9.400	13.964	13.962	1.964	1.964	1.0110	4.47	0.0541	8.88
9.600	9.806	9.805	1.828	1.828	1.0110	4.51	0.0608	7.71
9.800	7.762	7.761	1.676	1.676	1.0110	4.59	0.0556	8.18
10.000	5.559	5.558	1.545	1.545	1.0110	4.58	0.0608	7.33
10.200	4.677	4.677	1.421	1.421	1.0110	4.55	0.0590	7.44
10.400	4.183	4.182	1.282	1.281	1.0110	4.52	0.0531	8.13
10.600	3.639	3.639	1.099	1.099	1.0110	4.55	0.0481	8.78
10.800	3.184	3.184	0.916	0.916	1.0110	4.56	0.0485	8.53
11.000	2.939	2.938	0.752	0.752	1.0110	4.56	0.0523	7.77
11.200	2.884	2.884	0.604	0.604	1.0110	4.55	0.0581	6.87
11.400	2.917	2.918	0.529	0.529	1.0110	4.48	0.0625	6.33
11.600	3.806	3.807	0.454	0.454	1.0110	4.45	0.0538	7.25
11.800	5.111	5.112	0.389	0.389	1.0110	4.43	0.0456	8.43
12.000	6.288	6.289	0.309	0.309	1.0110	4.46	0.0453	8.31
12.200	7.780	7.781	0.259	0.259	1.0110	4.46	0.0424	8.73

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A6-02PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	37.155	37.153	3.026	3.026	1.0140	4.02	0.0442	13.14
8.400	29.007	29.006	2.811	2.811	1.0140	4.00	0.0541	10.51
8.600	28.249	28.248	2.632	2.632	1.0140	3.94	0.0526	10.64
8.800	29.922	29.921	2.452	2.452	1.0140	4.03	0.0460	11.74
9.000	25.410	25.408	2.289	2.289	1.0140	4.12	0.0483	10.82
9.200	21.651	21.651	2.158	2.158	1.0140	4.08	0.0515	9.98
9.400	20.137	20.136	2.026	2.026	1.0140	4.11	0.0477	10.50
9.600	15.451	15.451	1.915	1.915	1.0140	4.07	0.0553	8.92
9.800	14.504	14.503	1.793	1.793	1.0140	4.11	0.0483	9.94
10.000	12.647	12.646	1.667	1.667	1.0140	4.16	0.0434	10.79
10.200	8.963	8.963	1.540	1.540	1.0140	4.20	0.0470	9.71
10.400	6.879	6.878	1.429	1.428	1.0140	4.19	0.0499	8.98
10.600	3.508	3.507	1.346	1.346	1.0140	4.16	0.0855	5.17
10.800	3.767	3.767	1.313	1.313	1.0140	3.96	0.0844	5.26
11.000	5.059	5.058	1.189	1.189	1.0140	3.94	0.0509	8.58
11.200	5.483	5.482	1.032	1.032	1.0140	3.99	0.0367	11.62
11.400	5.383	5.382	0.869	0.869	1.0140	4.03	0.0319	13.06
11.600	5.821	5.821	0.743	0.743	1.0140	4.03	0.0285	14.37
11.800	6.369	6.368	0.624	0.624	1.0140	4.03	0.0270	14.95
12.000	7.064	7.064	0.513	0.513	1.0140	4.04	0.0268	14.74
12.200	7.999	7.999	0.426	0.426	1.0140	4.05	0.0270	14.42

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AS 47-01P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.200	10.081	10.081	2.855	2.855	2.225	4.39	0.0597	34.69
2.300	12.618	12.619	2.215	2.215	2.225	4.29	0.0515	38.95
2.400	15.695	15.695	1.680	1.680	2.225	4.27	0.0482	39.98
2.450	16.501	16.501	1.435	1.435	2.225	4.30	0.0505	37.26
2.500	16.387	16.388	1.230	1.230	2.225	4.33	0.0555	33.07
2.600	19.521	19.522	0.910	0.910	2.225	4.40	0.0545	32.14
2.700	20.464	20.465	0.745	0.745	2.225	4.34	0.0551	30.80
2.800	20.989	20.990	0.545	0.545	2.225	4.41	0.0601	27.00
2.900	22.004	22.005	0.445	0.445	2.225	4.33	0.0591	26.77
3.000	23.878	23.879	0.315	0.315	2.225	4.37	0.0582	26.17
3.100	26.303	26.303	0.220	0.220	2.225	4.36	0.0546	27.02
3.200	24.746	24.746	0.135	0.135	2.225	4.35	0.0593	24.13
3.300	22.909	22.909	0.095	0.095	2.225	4.21	0.0629	22.42
3.400	24.831	24.831	0.025	0.025	2.225	4.20	0.0580	23.62
3.500	24.266	24.266	5.257	5.257	2.225	4.27	0.0592	22.30
3.600	23.933	23.933	4.974	4.974	2.225	4.25	0.0581	22.14
3.700	23.933	23.933	4.717	4.717	2.225	4.22	0.0554	22.65
3.800	22.465	22.464	4.447	4.447	2.225	4.30	0.0546	22.20
3.900	20.953	20.952	4.222	4.222	2.225	4.27	0.0538	22.00
4.000	19.498	19.497	3.991	3.991	2.225	4.30	0.0512	22.50

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A7-02P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	24.071	24.072	0.177	0.177	0.9910	3.12	0.0472	13.95
8.400	23.174	23.174	0.132	0.132	0.9910	3.15	0.0513	12.50
8.600	24.044	24.044	0.114	0.114	0.9910	3.07	0.0487	13.00
8.800	24.182	24.183	0.074	0.074	0.9910	3.11	0.0502	12.26
9.000	22.725	22.725	0.049	0.049	0.9910	3.09	0.0535	11.28
9.200	21.135	21.135	0.027	0.027	0.9910	3.06	0.0573	10.36
9.400	22.182	22.182	0.007	0.007	0.9910	3.03	0.0540	10.81
9.600	21.014	21.014	2.138	2.138	0.9910	2.95	0.0553	10.47
9.800	20.441	20.441	2.021	2.021	0.9910	3.02	0.0569	9.86
10.000	19.055	19.054	1.915	1.915	0.9910	3.07	0.0595	9.15
10.200	16.982	16.982	1.831	1.831	0.9910	3.05	0.0643	8.34
10.400	12.488	12.488	1.742	1.741	0.9910	3.08	0.0830	6.30
10.600	5.977	5.977	1.669	1.669	0.9910	3.05	0.1726	3.00
10.800	8.750	8.750	1.621	1.621	0.9910	2.91	0.1117	4.65
11.000	13.859	13.851	1.552	1.552	0.9910	2.90	0.0651	7.82
11.200	11.858	11.857	1.475	1.475	0.9910	2.94	0.0691	7.19
11.400	11.169	11.168	1.387	1.387	0.9910	3.04	0.0619	7.76
11.600	10.544	10.543	1.316	1.316	0.9910	3.05	0.0576	8.18
11.800	9.120	9.119	1.242	1.242	0.9910	3.08	0.0571	8.08
12.000	7.464	7.464	1.151	1.151	0.9910	3.15	0.0555	8.07
12.200	6.166	6.165	1.066	1.066	0.9910	3.18	0.0555	7.90

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A7-02PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	23.496	23.497	0.213	0.213	1.0050	2.94	0.0440	15.43
8.400	23.768	23.769	0.173	0.173	1.0050	2.93	0.0448	14.80
8.600	24.127	24.127	0.145	0.145	1.0050	2.89	0.0446	14.64
8.800	25.645	25.645	0.100	0.100	1.0050	2.93	0.0440	14.39
9.000	24.462	24.463	0.055	0.055	1.0050	2.99	0.0483	12.70
9.200	22.751	22.751	0.028	0.028	1.0050	2.99	0.0521	11.51
9.400	20.917	20.917	2.225	2.225	1.0050	3.01	0.0569	10.29
9.600	15.849	15.849	2.124	2.124	1.0050	2.94	0.0735	7.89
9.800	17.559	17.559	2.022	2.022	1.0050	2.94	0.0651	8.74
10.000	17.519	17.518	1.911	1.911	1.0050	3.02	0.0636	8.64
10.200	14.093	14.092	1.817	1.817	1.0050	3.04	0.0757	7.09
10.400	12.134	12.133	1.753	1.752	1.0050	2.94	0.0853	6.28
10.600	12.064	12.064	1.685	1.685	1.0050	2.88	0.0824	6.44
10.800	13.996	13.995	1.602	1.602	1.0050	2.92	0.0655	7.90
11.000	13.932	13.931	1.533	1.533	1.0050	2.91	0.0613	8.30
11.200	10.715	10.715	1.451	1.451	1.0050	2.97	0.0706	7.01
11.400	10.629	10.628	1.388	1.388	1.0050	2.95	0.0652	7.48
11.600	12.927	12.926	1.327	1.327	1.0050	2.92	0.0489	9.84
11.800	12.957	12.956	1.283	1.283	1.0050	2.85	0.0471	10.18
12.000	11.817	11.816	1.177	1.177	1.0050	2.98	0.0391	11.79
12.200	10.411	10.410	1.112	1.112	1.0050	2.97	0.0392	11.58

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 47-04P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	20.091	20.091	0.208	0.208	1.0100	2.94	0.0517	13.13
8.400	20.893	20.893	0.148	0.148	1.0100	3.00	0.0537	12.21
8.600	20.845	20.845	0.125	0.125	1.0100	2.95	0.0537	12.05
8.800	22.131	22.131	0.080	0.080	1.0100	2.99	0.0529	11.84
9.000	21.478	21.479	0.050	0.050	1.0100	2.99	0.0552	11.11
9.200	19.498	19.498	0.015	0.015	1.0100	3.02	0.0618	9.66
9.400	18.051	18.051	2.215	2.215	1.0100	3.03	0.0664	8.79
9.600	16.749	16.749	2.114	2.114	1.0100	2.97	0.0698	8.27
9.800	17.721	17.721	1.992	1.992	1.0100	3.07	0.0648	8.58
10.000	17.140	17.139	1.881	1.881	1.0100	3.15	0.0635	8.47
10.200	15.258	15.257	1.797	1.797	1.0100	3.12	0.0678	7.82
10.400	11.940	11.939	1.703	1.702	1.0100	3.17	0.0793	6.50
10.600	8.138	8.137	1.615	1.615	1.0100	3.21	0.1053	4.78
10.800	7.145	7.145	1.567	1.567	1.0100	3.08	0.1194	4.23
11.000	8.008	8.007	1.503	1.503	1.0100	3.03	0.0987	5.06
11.200	8.640	8.639	1.436	1.436	1.0100	3.01	0.0834	5.90
11.400	9.184	9.183	1.348	1.348	1.0100	3.07	0.0651	7.34
11.600	9.311	9.310	1.272	1.272	1.0100	3.09	0.0551	8.49
11.800	8.493	8.491	1.203	1.203	1.0100	3.08	0.0531	8.68
12.000	7.396	7.395	1.112	1.112	1.0100	3.13	0.0493	9.12
12.200	6.509	6.508	1.022	1.022	1.0100	3.15	0.0465	9.47

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A7-04PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	23.696	23.687	0.215	0.215	1.0080	2.93	0.0433	15.72
8.400	23.768	23.769	0.165	0.165	1.0080	2.95	0.0455	14.54
8.600	24.322	24.323	0.137	0.137	1.0080	2.91	0.0449	14.50
8.800	25.734	25.734	0.087	0.087	1.0080	2.97	0.0450	13.99
9.000	24.660	24.661	0.057	0.057	1.0080	2.97	0.0475	12.95
9.200	21.827	21.828	0.035	0.035	1.0080	2.94	0.0535	11.31
9.400	21.602	21.602	0.005	0.005	1.0080	2.96	0.0543	10.87
9.600	18.815	18.815	2.129	2.129	1.0080	2.91	0.0612	9.54
9.800	20.230	20.230	2.016	2.016	1.0080	2.95	0.0564	10.05
10.000	18.450	18.450	1.903	1.903	1.0080	3.04	0.0600	9.12
10.200	15.364	15.363	1.819	1.819	1.0080	3.01	0.0692	7.79
10.400	11.954	11.953	1.745	1.744	1.0080	2.96	0.0856	6.23
10.600	10.471	10.471	1.662	1.662	1.0080	2.98	0.0917	5.69
10.800	13.599	13.598	1.602	1.602	1.0080	2.91	0.0673	7.71
11.000	13.032	13.031	1.530	1.530	1.0080	2.91	0.0650	7.83
11.200	11.079	11.078	1.468	1.468	1.0080	2.88	0.0719	7.00
11.400	12.794	12.793	1.390	1.390	1.0080	2.92	0.0544	9.01
11.600	13.567	13.566	1.319	1.319	1.0080	2.93	0.0453	10.62
11.800	12.546	12.545	1.250	1.250	1.0080	2.94	0.0430	10.96
12.000	11.053	11.052	1.169	1.169	1.0080	2.98	0.0406	11.34
12.200	9.539	9.538	1.094	1.094	1.0080	3.00	0.0402	11.24

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 47-05P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	27.290	27.290	3.035	3.035	1.0050	4.02	0.0605	9.61
8.400	25.556	25.556	2.810	2.810	1.0050	4.07	0.0622	9.05
8.600	26.730	26.729	2.636	2.636	1.0050	3.97	0.0563	9.90
8.800	25.498	25.496	2.446	2.446	1.0050	4.14	0.0542	9.83
9.000	23.067	23.066	2.298	2.298	1.0050	4.13	0.0548	9.53
9.200	21.928	21.927	2.167	2.167	1.0050	4.10	0.0524	9.78
9.400	19.431	19.430	2.040	2.040	1.0050	4.11	0.0520	9.63
9.600	14.655	14.654	1.924	1.924	1.0050	4.10	0.0604	8.13
9.800	11.926	11.925	1.807	1.807	1.0050	4.13	0.0622	7.72
10.000	10.304	10.303	1.696	1.696	1.0050	4.13	0.0597	7.87
10.200	9.506	9.505	1.587	1.587	1.0050	4.13	0.0531	8.68
10.400	7.638	7.637	1.488	1.487	1.0050	4.11	0.0554	8.17
10.600	5.389	5.388	1.355	1.355	1.0050	4.16	0.0586	7.53
10.800	3.859	3.859	1.262	1.262	1.0050	4.13	0.0704	6.18
11.000	3.094	3.093	1.168	1.168	1.0050	4.09	0.0765	5.61
11.200	2.723	2.722	1.086	1.086	1.0050	4.02	0.0796	5.34
11.400	3.090	3.090	0.958	0.958	1.0050	3.99	0.0611	6.36
11.600	3.311	3.311	0.832	0.832	1.0050	3.98	0.0523	7.89
11.800	3.467	3.467	0.703	0.703	1.0050	3.98	0.0487	8.32
12.000	3.995	3.995	0.577	0.577	1.0050	4.00	0.0445	8.93
12.200	4.721	4.721	0.472	0.472	1.0050	4.02	0.0421	9.26

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 47-05PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	37.497	37.497	0.041	0.041	1.0120	3.65	0.0401	15.21
8.400	35.359	35.359	0.001	0.001	1.0120	3.71	0.0425	13.87
8.600	35.933	35.934	2.684	2.684	1.0120	3.62	0.0401	14.55
8.800	33.037	33.037	2.499	2.499	1.0120	3.73	0.0427	13.16
9.000	28.477	28.477	2.346	2.346	1.0120	3.76	0.0469	11.67
9.200	25.032	25.031	2.215	2.215	1.0120	3.73	0.0500	10.73
9.400	26.853	26.852	2.093	2.093	1.0120	3.73	0.0430	12.23
9.600	22.751	22.750	1.992	1.992	1.0120	3.65	0.0476	10.92
9.800	21.232	21.231	1.870	1.870	1.0120	3.74	0.0440	11.45
10.000	17.947	17.946	1.749	1.749	1.0120	3.83	0.0426	11.45
10.200	12.445	12.444	1.650	1.650	1.0120	3.83	0.0527	9.08
10.400	8.943	8.942	1.571	1.570	1.0120	3.77	0.0663	7.13
10.600	7.145	7.144	1.478	1.478	1.0120	3.76	0.0702	6.61
10.800	6.310	6.309	1.415	1.415	1.0120	3.67	0.0748	6.17
11.000	8.346	8.345	1.331	1.331	1.0120	3.63	0.0490	9.31
11.200	8.821	8.820	1.204	1.204	1.0120	3.69	0.0348	12.73
11.400	8.620	8.619	1.081	1.081	1.0120	3.73	0.0283	15.33
11.600	7.727	7.726	0.965	0.965	1.0120	3.74	0.0268	15.88
11.800	6.368	6.368	0.856	0.856	1.0120	3.73	0.0293	14.27
12.000	6.592	6.592	0.735	0.735	1.0120	3.74	0.0267	15.42
12.200	6.887	6.887	0.625	0.625	1.0120	3.75	0.0257	15.70

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A7-12D

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	21.184	21.184	0.062	0.062	1.0030	3.57	0.0690	8.93
8.400	20.277	20.277	0.027	0.027	1.0030	3.59	0.0724	8.29
8.600	20.488	20.488	0.002	0.002	1.0030	3.57	0.0703	8.36
8.800	18.578	18.578	2.513	2.513	1.0030	3.69	0.0770	7.34
9.000	13.693	13.693	2.360	2.360	1.0030	3.71	0.1008	5.47
9.200	15.223	15.223	2.239	2.239	1.0030	3.64	0.0858	6.35
9.400	16.963	16.962	2.112	2.112	1.0030	3.68	0.0714	7.42
9.600	14.093	14.092	2.001	2.001	1.0030	3.67	0.0797	6.52
9.800	13.599	13.598	1.894	1.894	1.0030	3.68	0.0746	6.81
10.000	13.852	13.850	1.783	1.783	1.0030	3.74	0.0628	7.87
10.200	13.614	13.613	1.684	1.684	1.0030	3.75	0.0551	8.77
10.400	11.762	11.761	1.600	1.599	1.0030	3.71	0.0568	8.39
10.600	10.990	10.989	1.507	1.507	1.0030	3.71	0.0515	9.07
10.800	9.817	9.816	1.414	1.414	1.0030	3.72	0.0481	9.53
11.000	9.057	9.056	1.340	1.340	1.0030	3.66	0.0465	9.75
11.200	7.700	7.699	1.243	1.243	1.0030	3.67	0.0449	9.90
11.400	6.761	6.760	1.148	1.148	1.0030	3.67	0.0428	10.22
11.600	6.033	6.032	1.064	1.064	1.0030	3.64	0.0422	10.23
11.800	5.248	5.248	0.965	0.965	1.0030	3.63	0.0420	10.10
12.000	4.503	4.503	0.869	0.869	1.0030	3.62	0.0441	9.48
12.200	4.300	4.300	0.774	0.774	1.0030	3.61	0.0433	9.52

DIELECTRIC PROPEPTIES OF OIL SHALE

SAMPLE NO. AX A7-12PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	24.266	24.266	0.139	0.139	0.9910	3.27	0.0512	12.56
8.400	24.689	24.689	0.072	0.072	0.9910	3.42	0.0551	11.15
8.600	23.933	23.933	0.059	0.059	0.9910	3.33	0.0552	11.03
8.800	20.441	20.441	0.009	0.009	0.9910	3.44	0.0671	8.71
9.000	18.051	18.051	2.422	2.422	0.9910	3.40	0.0745	7.72
9.200	19.679	19.679	2.291	2.291	0.9910	3.39	0.0666	8.47
9.400	19.011	19.010	2.164	2.164	0.9910	3.43	0.0669	8.21
9.600	17.338	17.338	2.068	2.068	0.9910	3.33	0.0705	7.73
9.800	16.255	16.255	1.941	1.941	0.9910	3.48	0.0697	7.49
10.000	13.756	13.755	1.825	1.825	0.9910	3.60	0.0727	6.92
10.200	10.280	10.279	1.751	1.751	0.9910	3.50	0.0932	5.37
10.400	9.772	9.772	1.677	1.676	0.9910	3.44	0.0916	5.41
10.600	9.430	9.429	1.599	1.599	0.9910	3.41	0.0863	5.65
10.800	9.300	9.300	1.509	1.509	0.9910	3.46	0.0742	6.40
11.000	8.414	8.413	1.427	1.427	0.9910	3.47	0.0703	6.63
11.200	7.137	7.136	1.343	1.343	0.9910	3.49	0.0698	6.54
11.400	6.966	6.965	1.252	1.252	0.9910	3.51	0.0584	7.65
11.600	6.202	6.201	1.171	1.171	0.9910	3.50	0.0560	7.86
11.800	5.970	5.970	1.087	1.087	0.9910	3.49	0.0497	8.70
12.000	5.572	5.571	0.976	0.976	0.9910	3.53	0.0433	9.78
12.200	5.012	5.011	0.866	0.866	0.9910	3.55	0.0413	10.04

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 47-14P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	24.462	24.463	0.192	0.192	1.0060	3.01	0.0442	15.17
8.400	24.406	24.407	0.147	0.147	1.0060	3.02	0.0463	14.12
8.600	25.498	25.498	0.122	0.122	1.0060	2.98	0.0444	14.50
8.800	27.542	27.543	0.079	0.079	1.0060	3.02	0.0428	14.58
9.000	26.977	26.978	0.044	0.044	1.0060	3.04	0.0446	13.63
9.200	21.928	21.928	0.009	0.009	1.0060	3.08	0.0557	10.62
9.400	17.378	17.378	2.211	2.211	1.0060	3.07	0.0697	8.32
9.600	18.344	18.344	2.113	2.113	1.0060	3.00	0.0640	8.97
9.800	19.884	19.884	1.996	1.996	1.0060	3.07	0.0579	9.60
10.000	18.685	18.685	1.883	1.883	1.0060	3.16	0.0586	9.16
10.200	16.730	16.729	1.788	1.788	1.0060	3.19	0.0611	8.58
10.400	12.779	12.778	1.702	1.701	1.0060	3.20	0.0740	6.93
10.600	7.630	7.629	1.604	1.604	1.0060	3.30	0.1086	4.57
10.800	6.761	6.761	0.009	0.009	1.0060	2.20	0.1385	4.31
11.000	6.918	6.918	0.029	0.029	1.0060	2.06	0.1268	4.78
11.200	8.414	8.413	1.423	1.423	1.0060	3.09	0.0818	5.94
11.400	8.580	8.579	1.337	1.337	1.0060	3.14	0.0667	7.09
11.600	7.718	7.717	1.234	1.234	1.0060	3.23	0.0573	7.99
11.800	6.863	6.862	1.157	1.157	1.0060	3.23	0.0552	8.15
12.000	6.310	6.309	1.059	1.059	1.0060	3.27	0.0485	9.08
12.200	5.559	5.559	0.951	0.951	1.0060	3.31	0.0448	9.59

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 47-14PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	29.241	29.243	0.213	0.213	0.9820	3.04	0.0360	18.52
8.400	30.095	30.096	0.156	0.156	0.9820	3.10	0.0377	17.15
8.600	31.696	31.696	0.133	0.133	0.9820	3.04	0.0357	17.83
8.800	34.514	34.515	0.088	0.088	0.9820	3.09	0.0345	17.90
9.000	33.113	33.114	0.053	0.053	0.9820	3.12	0.0368	16.32
9.200	30.903	30.903	0.031	0.031	0.9820	3.09	0.0393	15.02
9.400	29.923	29.923	0.006	0.006	0.9820	3.09	0.0405	14.28
9.600	26.242	26.242	2.127	2.127	0.9820	3.05	0.0454	12.53
9.800	26.607	26.607	2.020	2.020	0.9820	3.07	0.0442	12.58
10.000	26.607	26.607	1.904	1.904	0.9820	3.19	0.0428	12.48
10.200	25.264	25.263	1.825	1.825	0.9820	3.14	0.0433	12.21
10.400	24.294	24.293	1.746	1.745	0.9820	3.11	0.0428	12.14
10.600	21.232	21.231	1.658	1.658	0.9820	3.16	0.0453	11.19
10.800	18.836	18.835	1.580	1.580	0.9820	3.17	0.0468	10.61
11.000	16.425	16.424	1.509	1.509	0.9820	3.17	0.0491	9.94
11.200	14.962	14.961	1.437	1.437	0.9820	3.17	0.0484	9.90
11.400	14.093	14.092	1.351	1.351	0.9820	3.24	0.0428	10.88
11.600	13.804	13.802	1.285	1.285	0.9820	3.22	0.0389	11.80
11.800	12.618	12.617	1.216	1.216	0.9820	3.21	0.0372	12.14
12.000	11.337	11.336	1.130	1.130	0.9820	3.25	0.0338	13.05
12.200	10.023	10.022	1.040	1.040	0.9820	3.29	0.0313	13.77

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 47-15P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	27.164	27.165	0.086	0.085	1.0075	3.43	0.0508	12.36
8.400	26.424	26.424	0.050	0.050	1.0075	3.45	0.0527	11.61
8.600	25.119	25.119	0.033	0.032	1.0075	3.38	0.0542	11.15
8.800	21.503	21.503	2.553	2.553	1.0075	3.42	0.0634	9.25
9.000	23.496	23.496	2.410	2.410	1.0075	3.38	0.0565	10.21
9.200	22.336	22.335	2.284	2.284	1.0075	3.33	0.0575	9.88
9.400	20.324	20.323	2.157	2.157	1.0075	3.37	0.0611	9.05
9.600	17.539	17.538	2.056	2.056	1.0075	3.30	0.0680	8.05
9.800	16.749	16.749	1.944	1.944	1.0075	3.35	0.0668	7.97
10.000	14.757	14.756	1.829	1.829	1.0075	3.46	0.0675	7.60
10.200	12.633	12.632	1.730	1.730	1.0075	3.50	0.0699	7.16
10.400	10.280	10.279	1.638	1.638	1.0075	3.51	0.0755	6.49
10.600	7.228	7.227	1.543	1.543	1.0075	3.56	0.0903	5.29
10.800	5.140	5.140	1.465	1.465	1.0075	3.56	0.1113	4.21
11.000	5.146	5.146	1.380	1.380	1.0075	3.55	0.0946	4.88
11.200	4.405	4.405	1.264	1.264	1.0075	3.63	0.0829	5.40
11.400	3.520	3.519	1.130	1.130	1.0075	3.71	0.0767	5.67
11.600	2.968	2.968	0.994	0.994	1.0075	3.75	0.0724	5.87
11.800	2.630	2.630	0.841	0.841	1.0075	3.80	0.0695	5.97
12.000	2.723	2.723	0.674	0.674	1.0075	3.85	0.0638	6.36
12.200	3.258	3.259	0.530	0.530	1.0075	3.90	0.0573	6.91

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 47-15PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	29.923	29.923	0.093	0.093	1.0000	3.44	0.0458	13.72
8.400	29.376	29.377	0.053	0.053	1.0000	3.47	0.0476	12.80
8.600	28.907	28.907	0.030	0.030	1.0000	3.44	0.0477	12.55
8.800	27.797	27.797	2.539	2.539	1.0000	3.55	0.0503	11.44
9.000	20.488	20.488	2.393	2.383	1.0000	3.59	0.0668	8.38
9.200	17.721	17.721	2.272	2.272	1.0000	3.45	0.0739	7.56
9.400	21.953	21.953	2.150	2.150	1.0000	3.46	0.0570	9.58
9.600	21.306	21.305	2.039	2.039	1.0000	3.45	0.0556	9.62
9.800	20.184	20.183	1.922	1.922	1.0000	3.53	0.0536	9.67
10.000	15.293	15.292	1.811	1.811	1.0000	3.61	0.0624	8.06
10.200	10.927	10.926	1.717	1.717	1.0000	3.62	0.0779	6.32
10.400	9.683	9.682	1.648	1.647	1.0000	3.52	0.0832	5.88
10.600	8.790	8.789	1.580	1.580	1.0000	3.44	0.0862	5.63
10.800	9.649	9.648	1.497	1.497	1.0000	3.44	0.0682	6.98
11.000	8.964	8.963	1.418	1.418	1.0000	3.44	0.0638	7.34
11.200	8.913	8.912	1.336	1.336	1.0000	3.44	0.0548	8.39
11.400	9.441	9.439	1.233	1.233	1.0000	3.49	0.0406	11.04
11.600	8.995	8.994	1.142	1.142	1.0000	3.50	0.0355	12.40
11.800	7.880	7.879	1.048	1.048	1.0000	3.50	0.0341	12.68
12.000	6.863	6.862	0.932	0.932	1.0000	3.54	0.0323	13.11
12.200	6.237	6.237	0.827	0.827	1.0000	3.55	0.0316	13.15

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AU A7-C1

FREQUENCY MHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
100.00	100.000	100.000	143.167	143.167	6.528	5.87	0.0000	0.00
150.00	100.000	100.000	93.242	93.242	6.528	2.75	0.0000	0.00
200.00	100.000	100.000	67.890	67.890	6.528	4.02	0.0000	0.00
250.00	100.000	100.000	52.890	52.890	6.528	2.99	0.0000	0.00
300.00	95.000	95.001	42.487	42.487	6.528	3.31	0.1048	167.16
350.00	54.400	54.399	35.122	35.122	6.528	3.07	0.1184	131.70
400.00	36.000	35.998	29.556	29.556	6.528	2.85	0.1244	113.79
450.00	32.000	31.999	24.842	24.842	6.528	2.94	0.0858	144.36
500.00	40.000	39.998	21.001	21.001	6.528	2.91	0.0470	237.81
400.00	42.500	42.499	29.326	29.326	6.528	3.08	0.0918	148.05
450.00	36.000	35.998	24.722	24.722	6.528	3.03	0.0721	169.26
500.00	34.000	33.999	21.112	21.112	6.528	2.85	0.0578	195.63
550.00	26.000	25.999	17.642	17.642	6.528	2.93	0.0507	199.86
600.00	21.800	21.799	14.895	14.895	6.528	2.86	0.0475	197.98
650.00	17.500	17.499	12.442	12.442	6.528	2.84	0.0481	181.18
700.00	15.600	15.600	10.162	10.162	6.528	2.86	0.0457	176.44
750.00	14.500	14.500	8.242	8.242	6.528	2.86	0.0451	166.74
800.00	12.850	12.850	6.662	6.662	6.528	2.86	0.0497	142.02
850.00	15.200	15.200	5.252	5.252	6.528	2.89	0.0429	153.93
900.00	14.600	14.600	4.202	4.202	6.528	2.89	0.0470	132.68
950.00	40.000	39.999	8.010	8.010	6.528	1.63	0.0241	338.90
1000.00	35.000	34.999	7.140	7.140	6.528	1.68	0.0247	313.71
1000.00	30.000	30.000	6.240	6.240	6.528	1.68	0.0268	274.87
1100.00	28.000	28.000	4.660	4.660	6.528	1.70	0.0261	255.18
1200.00	17.200	17.200	3.270	3.270	6.528	1.76	0.0413	144.91

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A8-01A

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
9.200	11.549	11.547	2.880	2.880	1.0100	5.22	0.1267	4.03
8.400	9.539	9.538	2.645	2.645	1.0100	5.33	0.1217	4.05
8.600	7.700	7.699	2.456	2.456	1.0100	5.30	0.1260	3.84
8.800	6.026	6.025	2.264	2.264	1.0100	5.38	0.1192	3.93
9.000	4.446	4.446	2.083	2.083	1.0100	5.45	0.1159	3.93
9.200	3.479	3.479	1.922	1.922	1.0100	5.43	0.1120	3.98
9.400	2.455	2.454	1.752	1.752	1.0100	5.47	0.1116	3.90
9.600	1.905	1.905	1.619	1.619	1.0100	5.41	0.1159	3.69
9.800	1.496	1.496	1.402	1.402	1.0100	5.40	0.1095	3.83
10.000	1.216	1.216	1.051	1.051	1.0100	5.38	0.1120	3.68
10.200	1.245	1.245	0.623	0.623	1.0100	5.34	0.1192	3.40
10.400	1.549	1.549	0.530	0.530	1.0100	5.27	0.1089	3.68
10.600	2.018	2.019	0.420	0.420	1.0100	5.28	0.1037	3.79
10.800	2.371	2.372	0.320	0.320	1.0100	5.28	0.1136	3.39
11.000	2.645	2.646	0.280	0.280	1.0100	5.21	0.1160	3.28
11.200	2.968	2.969	0.255	0.255	1.0100	5.13	0.1133	3.32
11.400	3.532	3.532	0.225	0.225	1.0100	5.10	0.1074	3.46
11.600	4.271	4.271	0.200	0.200	1.0100	5.07	0.0983	3.72
11.800	5.087	5.088	0.170	0.170	1.0100	5.06	0.0931	3.87
12.000	5.841	5.842	0.135	0.135	1.0100	5.09	0.0936	3.77
12.200	6.660	6.661	0.105	0.105	1.0100	5.13	0.0927	3.73

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A8-01B

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	15.382	15.380	2.882	2.882	1.0100	5.18	0.0948	5.40
8.400	13.047	13.045	2.665	2.665	1.0100	5.14	0.0960	5.22
8.600	10.447	10.446	2.471	2.471	1.0100	5.15	0.0998	4.91
8.800	8.590	8.589	2.294	2.294	1.0100	5.15	0.0982	4.87
9.000	6.509	6.508	2.123	2.123	1.0100	5.19	0.0992	4.70
9.200	5.236	5.235	1.952	1.952	1.0100	5.22	0.0903	5.03
9.400	3.703	3.702	1.820	1.820	1.0100	5.18	0.1033	4.32
9.600	3.037	3.037	1.704	1.704	1.0100	5.09	0.1076	4.10
9.800	2.541	2.541	1.524	1.524	1.0100	5.09	0.0930	4.64
10.000	1.905	1.905	1.311	1.311	1.0100	5.12	0.0904	4.67
10.200	1.567	1.567	1.162	1.162	1.0100	5.04	0.0986	4.23
10.400	1.622	1.622	0.886	0.885	1.0100	5.02	0.0877	4.67
10.600	1.841	1.841	0.640	0.640	1.0100	5.04	0.0851	4.72
10.800	2.054	2.054	0.480	0.480	1.0100	5.03	0.0926	4.26
11.000	2.239	2.239	0.420	0.420	1.0100	4.94	0.0950	4.11
11.200	2.917	2.918	0.350	0.350	1.0100	4.94	0.0873	4.40
11.400	3.447	3.448	0.290	0.290	1.0100	4.93	0.0880	4.29
11.600	4.325	4.326	0.250	0.250	1.0100	4.91	0.0805	4.61
11.800	5.383	5.383	0.220	0.220	1.0100	4.88	0.0720	5.09
12.000	6.339	6.339	0.170	0.170	1.0100	4.94	0.0741	4.83
12.200	7.447	7.448	0.130	0.130	1.0100	5.00	0.0741	4.73

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 48-02P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	13.474	13.473	2.885	2.885	1.0150	5.11	0.1093	4.72
8.400	12.474	12.473	2.660	2.660	1.0150	5.13	0.0984	5.10
8.600	9.517	9.516	2.481	2.481	1.0150	5.04	0.1141	4.34
8.800	7.762	7.761	2.284	2.284	1.0150	5.17	0.1036	4.61
9.000	6.012	6.011	2.108	2.108	1.0150	5.21	0.1001	4.65
9.200	4.732	4.731	1.937	1.937	1.0150	5.24	0.0933	4.86
9.400	3.304	3.303	1.780	1.780	1.0150	5.25	0.0992	4.47
9.600	2.427	2.426	1.669	1.669	1.0150	5.19	0.1138	3.84
9.800	2.042	2.041	1.487	1.487	1.0150	5.16	0.1015	4.23
10.000	1.778	1.778	1.266	1.266	1.0150	5.13	0.0910	4.64
10.200	1.603	1.603	0.984	0.984	1.0150	5.12	0.0874	4.73
10.400	1.714	1.718	0.725	0.725	1.0150	5.11	0.0854	4.76
10.600	2.054	2.054	0.545	0.545	1.0150	5.11	0.0846	4.71
10.800	2.385	2.385	0.425	0.425	1.0150	5.09	0.0895	4.38
11.000	2.630	2.631	0.355	0.355	1.0150	5.04	0.0953	4.06
11.200	3.236	3.236	0.315	0.315	1.0150	4.99	0.0876	4.36
11.400	4.074	4.074	0.260	0.260	1.0150	5.00	0.0835	4.49
11.600	4.842	4.842	0.225	0.225	1.0150	4.97	0.0794	4.65
11.800	5.623	5.624	0.190	0.190	1.0150	4.96	0.0778	4.67
12.000	6.310	6.310	0.140	0.140	1.0150	5.04	0.0848	4.18
12.200	7.120	7.121	0.115	0.115	1.0150	5.03	0.0827	4.22

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A9-02PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	18.513	18.513	2.915	2.915	1.0050	4.95	0.0859	6.09
8.400	16.237	16.235	2.675	2.675	1.0050	5.11	0.0799	6.29
8.600	13.884	13.882	2.491	2.491	1.0050	5.04	0.0815	6.07
8.800	11.350	11.349	2.304	2.304	1.0050	5.11	0.0781	6.14
9.000	8.110	8.108	2.118	2.118	1.0050	5.22	0.0789	5.88
9.200	5.514	5.514	1.952	1.952	1.0050	5.26	0.0860	5.26
9.400	3.529	3.527	1.820	1.820	1.0050	5.25	0.1067	4.16
9.600	2.985	2.985	1.709	1.709	1.0050	5.14	0.1102	3.99
9.800	2.265	2.264	1.607	1.607	1.0050	5.20	0.0972	4.40
10.000	1.445	1.445	1.311	1.311	1.0050	5.26	0.1112	3.75
10.200	1.189	1.188	1.842	1.842	1.0050	5.23	0.1700	2.41
10.400	1.660	1.659	1.668	1.668	1.0050	4.69	0.2399	1.78
10.600	1.778	1.778	1.375	1.375	1.0050	4.43	0.1490	2.88
10.800	1.738	1.738	1.052	1.052	1.0050	4.51	0.0984	4.23
11.000	1.950	1.950	0.753	0.753	1.0050	4.59	0.0790	5.13
11.200	2.570	2.571	0.560	0.560	1.0050	4.65	0.0677	5.84
11.400	3.338	3.339	0.435	0.435	1.0050	4.68	0.0632	6.12
11.600	4.241	4.242	0.350	0.350	1.0050	4.70	0.0604	6.28
11.800	5.218	5.219	0.280	0.280	1.0050	4.73	0.0500	6.20
12.000	6.180	6.181	0.223	0.223	1.0050	4.76	0.0613	5.94
12.200	7.244	7.245	0.175	0.175	1.0050	4.81	0.0626	5.70

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A8-03P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
9.200	11.354	11.349	2.885	2.885	1.0000	5.28	0.1322	3.84
9.400	9.840	9.839	2.660	2.660	1.0000	5.32	0.1260	3.92
9.600	8.156	8.156	2.446	2.446	1.0000	5.33	0.1247	3.86
9.800	6.494	6.493	2.271	2.271	1.0000	5.44	0.1147	4.06
9.900	4.824	4.824	2.083	2.083	1.0000	5.53	0.1078	4.19
9.200	3.487	3.487	1.912	1.912	1.0000	5.56	0.1072	4.11
9.400	2.454	2.454	1.772	1.772	1.0000	5.55	0.1164	3.71
9.600	1.718	1.718	1.619	1.619	1.0000	5.58	0.1202	3.51
9.900	1.244	1.244	1.657	1.657	1.0000	5.57	0.1438	2.88
10.000	1.454	1.454	1.691	1.691	1.0000	5.22	0.1758	2.38
10.200	1.318	1.318	1.319	1.319	1.0000	5.12	0.1275	3.25
10.400	1.349	1.349	0.760	0.760	1.0000	5.19	0.1064	3.79
10.600	1.738	1.738	0.510	0.510	1.0000	5.23	0.1015	3.89
10.800	2.252	2.252	0.405	0.405	1.0000	5.23	0.0969	3.99
11.000	2.803	2.803	0.320	0.320	1.0000	5.25	0.0982	3.86
11.200	3.210	3.210	0.260	0.260	1.0000	5.24	0.1041	3.58
11.400	3.300	3.300	0.215	0.215	1.0000	5.18	0.1179	3.12
11.600	3.855	3.855	0.205	0.205	1.0000	5.10	0.1057	3.45
11.800	4.913	4.923	0.180	0.180	1.0000	5.09	0.0939	3.82
12.000	5.683	5.683	0.135	0.135	1.0000	5.17	0.0963	3.63
12.200	6.531	6.532	0.110	0.110	1.0000	5.18	0.0929	3.71

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 48-030P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	17.783	17.782	2.930	2.930	1.0100	4.78	0.0917	5.81
8.400	15.311	15.310	2.695	2.695	1.0100	4.91	0.0903	5.69
8.600	13.552	13.551	2.516	2.516	1.0100	4.92	0.0913	5.54
8.800	11.482	11.480	2.329	2.329	1.0100	4.92	0.0859	5.70
9.000	8.831	8.829	2.083	2.083	1.0100	5.30	0.0629	7.33
9.200	6.998	6.997	1.989	1.989	1.0100	5.05	0.0807	5.73
9.400	5.012	5.011	1.842	1.842	1.0100	5.05	0.0870	5.20
9.600	3.273	3.273	1.709	1.709	1.0100	5.06	0.1035	4.28
9.800	2.630	2.630	1.619	1.619	1.0100	4.95	0.1161	3.78
10.000	2.818	2.818	1.471	1.471	1.0100	4.84	0.0893	4.86
10.200	2.455	2.454	1.269	1.269	1.0100	4.86	0.0756	5.62
10.400	2.738	2.738	1.023	1.022	1.0100	4.88	0.0546	7.60
10.600	2.226	2.226	0.790	0.790	1.0100	4.91	0.0655	6.21
10.800	2.483	2.483	0.610	0.610	1.0100	4.91	0.0658	6.06
11.000	2.951	2.952	0.490	0.490	1.0100	4.90	0.0651	6.03
11.200	3.459	3.460	0.375	0.375	1.0100	4.93	0.0702	5.47
11.400	3.896	3.900	0.300	0.300	1.0100	4.93	0.0763	4.95
11.600	3.673	3.673	0.275	0.275	1.0100	4.81	0.0861	4.36
11.800	4.656	4.656	0.260	0.260	1.0100	4.73	0.0716	5.20
12.000	5.821	5.822	0.195	0.195	1.0100	4.82	0.0725	5.00
12.200	6.966	6.967	0.160	0.160	1.0100	4.83	0.0693	5.14

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AS A8-C1

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.200	14.555	14.556	5.365	5.365	2.985	2.61	0.0200	134.09
2.300	14.588	14.589	1.110	1.110	2.985	3.56	0.0813	27.06
2.400	15.170	15.171	0.800	0.800	2.985	3.56	0.0824	25.58
2.450	14.894	14.894	0.655	0.655	2.985	3.59	0.0875	23.52
2.500	15.399	15.400	0.530	0.530	2.985	3.61	0.0877	22.91
2.600	17.947	17.947	0.330	0.330	2.985	3.65	0.0789	24.37
2.700	15.417	15.417	0.185	0.185	2.985	3.63	0.0930	19.98
2.800	16.692	16.692	0.035	0.035	2.985	3.67	0.0865	20.59
2.900	16.444	16.444	7.325	7.325	2.985	3.67	0.0855	20.10
3.000	15.223	15.223	6.733	6.733	2.985	3.67	0.0878	18.93
3.100	14.842	14.842	6.201	6.201	2.985	3.70	0.0827	19.36
3.200	12.882	12.882	5.735	5.735	2.985	3.70	0.0850	18.24
3.300	10.532	10.531	5.342	5.342	2.985	3.65	0.0929	16.32
3.400	8.872	8.871	4.965	4.965	2.985	3.62	0.0949	15.55
3.500	7.219	7.219	4.587	4.587	2.985	3.64	0.0950	15.06
3.600	6.383	6.382	4.234	4.234	2.985	3.62	0.0870	16.04
3.700	5.383	5.382	3.877	3.876	2.985	3.61	0.0813	16.71
3.800	4.426	4.425	3.467	3.466	2.985	3.63	0.0737	17.89
3.900	3.548	3.548	3.077	3.077	2.985	3.62	0.0729	17.65
4.000	2.982	2.982	2.641	2.641	2.985	3.61	0.0710	17.68

DIELECTRIC PROPERTIES OF OIL SHALL

SAMPLE NO. AS A8-C2

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.200	14.825	14.825	1.415	1.415	2.985	3.64	0.0858	26.53
2.300	17.783	17.783	1.100	1.100	2.985	3.58	0.0674	32.52
2.400	14.655	14.656	0.810	0.810	2.985	3.55	0.0846	24.96
2.450	11.695	11.695	1.135	1.135	2.985	3.11	0.0782	28.27
2.500	15.276	15.276	0.490	0.490	2.985	3.67	0.0914	21.84
2.600	15.863	15.863	0.320	0.320	2.985	3.66	0.0900	21.35
2.700	16.144	16.144	0.185	0.185	2.985	3.63	0.0888	20.92
2.800	16.125	16.125	0.015	0.015	2.985	3.71	0.0905	19.57
2.900	15.346	15.346	7.305	7.305	2.985	3.71	0.0923	18.53
3.000	14.605	14.605	6.703	6.703	2.985	3.74	0.0915	18.01
3.100	13.474	13.474	6.191	6.191	2.985	3.72	0.0910	17.55
3.200	12.232	12.231	5.715	5.715	2.985	3.75	0.0883	17.47
3.300	10.351	10.351	5.322	5.322	2.985	3.69	0.0926	16.28
3.400	8.630	8.629	4.915	4.915	2.985	3.71	0.0916	15.92
3.500	7.236	7.235	4.547	4.547	2.985	3.69	0.0897	15.83
3.600	6.152	6.151	4.214	4.214	2.985	3.65	0.0877	15.84
3.700	5.152	5.152	3.837	3.836	2.985	3.65	0.0806	16.77
3.900	4.164	4.163	3.437	3.436	2.985	3.66	0.0756	17.37
3.900	3.354	3.353	2.987	2.987	2.985	3.67	0.0717	17.82
4.000	2.831	2.831	2.551	2.551	2.985	3.66	0.0714	17.48

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AU A8-C3

FREQUENCY MHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
100.00	100.000	100.000	144.613	144.613	5.182	6.04	0.0000	0.00
150.00	100.000	100.000	94.488	94.488	5.182	6.45	0.0000	0.00
200.00	100.000	100.000	69.486	69.486	5.182	4.28	0.0000	0.00
250.00	100.000	100.000	54.336	54.336	5.182	4.20	0.0000	0.00
300.00	95.000	95.001	44.203	44.203	5.182	3.89	0.1872	86.52
350.00	40.000	39.999	36.868	36.868	5.182	3.80	0.2675	52.74
400.00	53.000	52.998	31.242	31.242	5.182	3.74	0.1266	97.68
450.00	31.500	31.499	26.658	26.658	5.182	3.87	0.1279	84.50
500.00	15.700	15.699	22.827	22.827	5.182	3.96	0.1609	59.84
400.00	29.000	28.999	30.882	30.882	5.182	4.48	0.1703	66.39
450.00	23.500	23.499	26.878	26.878	5.182	3.56	0.1995	56.65
500.00	16.900	16.899	22.997	22.997	5.182	3.77	0.1646	59.93
550.00	12.070	12.069	19.608	19.608	5.182	3.91	0.1446	60.85
600.00	9.200	9.200	16.811	16.811	5.182	3.85	0.1379	58.95
650.00	7.100	7.100	14.358	14.358	5.182	3.78	0.1374	55.13
700.00	5.800	5.800	12.088	12.088	5.182	3.74	0.1341	52.68
750.00	4.970	4.970	9.828	9.828	5.182	3.80	0.1291	50.71
800.00	4.600	4.600	7.948	7.948	5.182	3.80	0.1282	47.86
850.00	4.700	4.700	6.388	6.388	5.182	3.79	0.1240	46.58
900.00	5.080	5.080	5.088	5.088	5.182	3.80	0.1195	45.60
915.00	5.350	5.350	4.798	4.798	5.182	3.78	0.1154	46.54
950.00	5.500	5.500	4.208	4.208	5.182	3.73	0.1172	44.43
1000.00	5.600	5.600	3.698	3.698	5.182	3.57	0.1204	42.06
1100.00	7.200	7.200	2.548	2.548	5.182	3.49	0.1075	43.24
1200.00	7.500	7.500	1.608	1.608	5.182	3.51	0.1223	34.78

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A9-01P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	22.192	22.180	2.900	2.900	1.0000	5.12	0.0692	7.44
8.400	20.300	20.298	2.680	2.680	1.0000	5.12	0.0650	7.73
8.600	18.323	18.321	2.491	2.491	1.0000	5.08	0.0617	7.98
8.800	16.349	16.347	2.319	2.319	1.0000	5.05	0.0580	9.32
9.000	13.335	13.333	2.133	2.133	1.0000	5.17	0.0519	8.99
9.200	11.130	11.128	1.982	1.982	1.0000	5.13	0.0500	9.16
9.400	8.185	8.183	1.832	1.832	1.0000	5.11	0.0528	8.50
9.600	6.166	6.165	1.684	1.684	1.0000	5.09	0.0544	8.11
9.800	4.624	4.623	1.507	1.507	1.0000	5.11	0.0525	8.21
10.000	3.673	3.672	1.336	1.336	1.0000	5.09	0.0518	8.17
10.200	2.917	2.917	1.139	1.139	1.0000	5.08	0.0531	7.82
10.400	2.427	2.427	0.913	0.912	1.0000	5.09	0.0579	7.03
10.600	2.188	2.188	0.710	0.710	1.0000	5.08	0.0680	5.88
10.800	2.042	2.042	0.600	0.600	1.0000	4.99	0.0799	4.96
11.000	2.270	2.270	0.540	0.540	1.0000	4.88	0.0775	5.07
11.200	3.126	3.126	0.470	0.470	1.0000	4.84	0.0632	6.13
11.400	4.487	4.488	0.385	0.385	1.0000	4.85	0.0528	7.21
11.600	5.888	5.889	0.305	0.305	1.0000	4.88	0.0499	7.47
11.800	7.120	7.121	0.250	0.250	1.0000	4.89	0.0491	7.45
12.000	7.989	7.990	0.205	0.205	1.0000	4.90	0.0512	7.02
12.200	10.035	10.035	0.165	0.165	1.0000	4.93	0.0474	7.43

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A9-01PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	32.696	32.695	2.970	2.970	1.0100	4.46	0.0514	10.73
8.400	30.620	30.618	2.745	2.745	1.0100	4.52	0.0498	10.73
8.600	29.478	29.476	2.561	2.561	1.0100	4.48	0.0470	11.17
8.800	25.586	25.584	2.384	2.384	1.0100	4.53	0.0468	10.89
9.000	22.856	22.854	2.213	2.213	1.0100	4.63	0.0424	11.62
9.200	21.306	21.303	2.067	2.067	1.0100	4.63	0.0377	12.77
9.400	17.989	17.986	1.920	1.920	1.0100	4.67	0.0350	13.42
9.600	14.388	14.386	1.789	1.789	1.0100	4.65	0.0355	12.99
9.800	11.194	11.193	1.642	1.642	1.0100	4.67	0.0343	13.14
10.000	8.954	8.952	1.471	1.471	1.0100	4.73	0.0305	14.42
10.200	6.630	6.629	1.317	1.317	1.0100	4.72	0.0323	13.34
10.400	4.656	4.655	1.143	1.142	1.0100	4.73	0.0369	11.44
10.600	3.548	3.548	0.970	0.970	1.0100	4.72	0.0429	9.67
10.800	3.173	3.173	0.827	0.827	1.0100	4.67	0.0470	8.70
11.000	3.556	3.557	0.703	0.703	1.0100	4.63	0.0436	9.24
11.200	4.467	4.467	0.583	0.583	1.0100	4.61	0.0383	10.37
11.400	5.559	5.560	0.480	0.480	1.0100	4.60	0.0354	11.01
11.600	6.776	6.777	0.390	0.390	1.0100	4.61	0.0347	11.06
11.800	8.251	8.252	0.330	0.330	1.0100	4.59	0.0330	11.46
12.000	9.451	9.453	0.260	0.260	1.0100	4.63	0.0354	10.45
12.200	11.029	11.029	0.215	0.215	1.0100	4.63	0.0352	10.32

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A9-02P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	23.523	23.522	2.905	2.905	1.0150	4.93	0.0651	8.05
8.400	20.441	20.439	2.675	2.675	1.0150	5.00	0.0629	8.08
8.600	18.218	18.216	2.491	2.481	1.0150	4.99	0.0594	8.36
8.800	14.555	14.554	2.294	2.294	1.0150	5.05	0.0582	8.30
9.000	11.402	11.401	2.118	2.118	1.0150	5.09	0.0570	8.25
9.200	9.268	9.267	1.962	1.962	1.0150	5.06	0.0554	8.32
9.400	6.918	6.917	1.792	1.792	1.0150	5.09	0.0541	8.32
9.600	5.152	5.151	1.649	1.649	1.0150	5.03	0.0582	7.61
9.800	4.360	4.359	1.462	1.462	1.0150	5.04	0.0503	8.62
10.000	3.833	3.832	1.266	1.266	1.0150	5.03	0.0446	9.54
10.200	3.416	3.416	1.057	1.057	1.0150	5.03	0.0426	9.80
10.400	3.388	3.388	0.866	0.865	1.0150	5.01	0.0416	9.87
10.600	3.784	3.785	0.675	0.675	1.0150	5.02	0.0407	9.89
10.800	4.266	4.266	0.550	0.550	1.0150	4.99	0.0416	9.52
11.000	5.012	5.013	0.445	0.445	1.0150	4.97	0.0424	9.17
11.200	6.026	6.026	0.370	0.370	1.0150	4.95	0.0418	9.17
11.400	7.079	7.080	0.305	0.305	1.0150	4.94	0.0424	8.88
11.600	8.222	8.223	0.255	0.255	1.0150	4.93	0.0426	8.70
11.800	9.408	9.409	0.220	0.220	1.0150	4.89	0.0418	8.75
12.000	11.003	11.004	0.170	0.170	1.0150	4.94	0.0431	8.31
12.200	13.198	13.199	0.145	0.145	1.0150	4.91	0.0393	8.99

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A9-02PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	35.604	35.602	2.952	2.952	1.0080	4.62	0.0467	11.61
8.400	31.989	31.987	2.717	2.717	1.0080	4.75	0.0453	11.51
8.600	29.682	29.681	2.538	2.538	1.0080	4.66	0.0442	11.64
8.800	26.946	26.944	2.356	2.356	1.0080	4.73	0.0405	12.30
9.000	22.310	22.307	2.178	2.178	1.0080	4.84	0.0378	12.75
9.200	19.320	19.317	2.029	2.029	1.0080	4.83	0.0355	13.30
9.400	14.945	14.943	1.872	1.872	1.0080	4.87	0.0345	13.33
9.600	11.416	11.414	1.731	1.731	1.0080	4.85	0.0356	12.68
9.800	8.650	8.648	1.564	1.564	1.0080	4.89	0.0340	12.95
10.000	6.645	6.644	1.383	1.383	1.0080	4.91	0.0324	13.27
10.200	5.129	5.128	1.209	1.209	1.0080	4.90	0.0338	12.51
10.400	4.183	4.183	1.025	1.024	1.0080	4.89	0.0358	11.59
10.600	4.135	4.135	0.842	0.842	1.0080	4.88	0.0349	11.69
10.800	4.498	4.498	0.700	0.700	1.0080	4.85	0.0339	11.84
11.000	5.266	5.267	0.572	0.572	1.0080	4.83	0.0327	12.08
11.200	6.607	6.608	0.472	0.472	1.0080	4.81	0.0303	12.80
11.400	8.241	8.243	0.387	0.387	1.0080	4.80	0.0290	13.17
11.600	9.772	9.774	0.317	0.317	1.0080	4.81	0.0293	12.82
11.800	11.548	11.549	0.267	0.267	1.0080	4.79	0.0287	12.86
12.000	13.351	13.352	0.212	0.212	1.0080	4.82	0.0300	12.09
12.200	16.051	16.052	0.177	0.177	1.0080	4.82	0.0282	12.62

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A9-03P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	16.330	16.329	2.457	2.457	1.0100	5.37	0.0818	6.14
8.400	14.093	14.091	2.625	2.625	1.0100	5.41	0.0757	6.45
8.600	11.912	11.911	2.436	2.436	1.0100	5.34	0.0754	6.38
8.800	9.247	9.246	2.229	2.229	1.0100	5.44	0.0689	6.76
9.000	6.823	6.822	2.033	2.033	1.0100	5.49	0.0657	6.89
9.200	5.012	5.011	1.854	1.854	1.0100	5.48	0.0661	6.70
9.400	4.074	4.073	1.672	1.671	1.0100	5.44	0.0609	7.15
9.600	2.630	2.630	1.534	1.534	1.0100	5.38	0.0782	5.49
9.800	2.291	2.291	1.309	1.309	1.0100	5.35	0.0693	6.08
10.000	2.042	2.042	1.031	1.031	1.0100	5.36	0.0661	6.24
10.200	1.928	1.928	0.788	0.788	1.0100	5.34	0.0723	5.61
10.400	1.950	1.950	0.580	0.580	1.0100	5.31	0.0844	4.72
10.600	1.928	1.928	0.490	0.490	1.0100	5.19	0.0961	4.12
10.800	2.802	2.803	0.490	0.490	1.0100	5.08	0.0685	5.73
11.000	2.917	2.918	0.430	0.430	1.0100	4.99	0.0734	5.30
11.200	4.173	4.174	0.360	0.360	1.0100	4.98	0.0611	6.25
11.400	5.689	5.689	0.295	0.295	1.0100	4.99	0.0541	6.92
11.600	6.910	6.911	0.240	0.240	1.0100	5.01	0.0533	6.90
11.800	7.971	7.972	0.200	0.200	1.0100	5.00	0.0532	6.80
12.000	9.089	9.090	0.160	0.160	1.0100	5.02	0.0543	6.53
12.200	10.593	10.593	0.125	0.125	1.0100	5.06	0.0535	6.51

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. 4X 49-03PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	25.235	25.233	2.925	2.925	1.0100	4.82	0.0635	8.35
8.400	22.725	22.723	2.685	2.685	1.0100	4.97	0.0586	8.70
8.600	20.654	20.652	2.481	2.481	1.0100	5.04	0.0525	9.42
8.800	15.188	15.186	2.279	2.279	1.0100	5.17	0.0526	9.06
9.000	9.016	9.014	2.063	2.063	1.0100	5.36	0.0569	8.05
9.200	3.963	3.962	1.872	1.872	1.0100	5.49	0.0858	5.17
9.400	1.698	1.698	1.805	1.805	1.0100	5.68	0.1419	3.01
9.600	3.311	3.311	2.014	2.014	1.0100	3.65	0.5524	0.98
9.800	5.669	5.668	1.732	1.732	1.0100	4.45	0.0935	4.94
10.000	5.182	5.181	1.496	1.496	1.0100	4.70	0.0556	7.91
10.200	3.307	3.307	1.287	1.287	1.0100	4.80	0.0593	7.20
10.400	3.330	3.330	1.068	1.067	1.0100	4.93	0.0468	8.92
10.600	3.296	3.296	0.800	0.800	1.0100	4.91	0.0439	9.25
10.800	3.162	3.163	0.595	0.595	1.0100	4.95	0.0526	7.55
11.000	2.455	2.455	0.430	0.430	1.0100	4.95	0.0959	4.54
11.200	2.483	2.483	0.475	0.475	1.0100	4.71	0.0786	5.00
11.400	4.503	4.504	0.395	0.395	1.0100	4.74	0.0516	7.45
11.600	6.738	6.738	0.318	0.318	1.0100	4.77	0.0422	8.93
11.800	8.270	8.271	0.255	0.255	1.0100	4.80	0.0417	8.86
12.000	8.660	8.661	0.200	0.200	1.0100	4.84	0.0482	7.50
12.200	11.259	11.260	0.165	0.165	1.0100	4.85	0.0422	8.41

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 49-04P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	20.821	20.820	2.910	2.910	1.0100	4.94	0.0750	6.99
8.400	19.076	19.075	2.685	2.685	1.0100	4.98	0.0699	7.29
8.600	16.181	16.179	2.496	2.496	1.0100	4.95	0.0710	7.03
8.800	13.852	13.850	2.304	2.304	1.0100	5.05	0.0642	7.53
9.000	11.156	11.154	2.123	2.123	1.0100	5.12	0.0594	7.89
9.200	9.354	9.353	1.947	1.947	1.0100	5.16	0.0516	8.85
9.400	6.942	6.941	1.782	1.782	1.0100	5.16	0.0519	8.61
9.600	5.188	5.187	1.604	1.604	1.0100	5.17	0.0505	8.65
9.800	3.913	3.912	1.399	1.399	1.0100	5.19	0.0486	8.80
10.000	3.055	3.055	1.151	1.151	1.0100	5.23	0.0480	8.70
10.200	2.630	2.630	0.939	0.939	1.0100	5.20	0.0520	7.89
10.400	2.483	2.483	0.730	0.730	1.0100	5.19	0.0587	6.87
10.600	2.802	2.803	0.610	0.610	1.0100	5.12	0.0580	6.96
10.800	3.508	3.508	0.515	0.515	1.0100	5.07	0.0530	7.41
11.000	4.587	4.587	0.430	0.430	1.0100	5.04	0.0476	8.12
11.200	6.152	6.153	0.350	0.350	1.0100	5.04	0.0431	8.80
11.400	7.771	7.772	0.275	0.275	1.0100	5.08	0.0427	8.71
11.600	8.760	8.761	0.230	0.230	1.0100	5.06	0.0439	8.33
11.800	9.966	9.967	0.200	0.200	1.0100	5.01	0.0427	8.45
12.000	11.246	11.247	0.155	0.155	1.0100	5.06	0.0450	7.86
12.200	13.122	13.123	0.130	0.130	1.0100	5.04	0.0422	8.25

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 49-04PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	33.763	33.766	2.950	2.950	1.0100	4.62	0.0490	11.05
8.400	29.174	29.173	2.725	2.725	1.0100	4.67	0.0505	10.41
8.600	27.290	27.288	2.536	2.536	1.0100	4.66	0.0477	10.77
8.800	23.201	23.199	2.354	2.354	1.0100	4.73	0.0467	10.68
9.000	18.239	18.237	2.183	2.183	1.0100	4.80	0.0472	10.26
9.200	16.520	16.517	2.022	2.022	1.0100	4.85	0.0403	11.70
9.400	11.817	11.815	1.865	1.865	1.0100	4.89	0.0423	10.86
9.600	7.161	7.160	1.729	1.729	1.0100	4.86	0.0556	8.11
9.800	4.325	4.324	1.589	1.589	1.0100	4.87	0.0710	6.22
10.000	3.780	3.779	1.461	1.461	1.0100	4.80	0.0675	6.46
10.200	3.456	3.455	1.327	1.327	1.0100	4.74	0.0618	6.96
10.400	3.516	3.515	1.168	1.167	1.0100	4.70	0.0505	8.38
10.600	3.882	3.881	0.970	0.970	1.0100	4.71	0.0392	10.58
10.800	4.217	4.217	0.777	0.777	1.0100	4.73	0.0353	11.51
11.000	4.571	4.571	0.630	0.630	1.0100	4.73	0.0355	11.24
11.200	5.023	5.024	0.500	0.500	1.0100	4.74	0.0380	10.30
11.400	5.559	5.560	0.405	0.405	1.0100	4.74	0.0411	9.37
11.600	6.855	6.856	0.345	0.345	1.0100	4.71	0.0384	9.88
11.800	7.499	7.500	0.285	0.285	1.0100	4.70	0.0415	8.99
12.000	7.595	7.595	0.235	0.235	1.0100	4.70	0.0480	7.65
12.200	11.482	11.483	0.200	0.200	1.0100	4.69	0.0359	10.07

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AS A9-C1

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.200	35.810	35.810	1.825	1.825	3.115	3.26	0.0275	87.30
2.300	39.359	39.357	1.370	1.370	3.115	3.22	0.0249	92.68
2.400	34.003	34.003	0.970	0.970	3.115	3.24	0.0316	69.88
2.450	36.141	36.142	0.815	0.815	3.115	3.25	0.0310	69.79
2.500	37.411	37.412	0.640	0.640	3.115	3.30	0.0320	65.72
2.600	37.931	37.932	0.430	0.430	3.115	3.30	0.0330	61.11
2.700	35.604	35.604	0.265	0.265	3.115	3.29	0.0361	54.02
2.800	39.400	39.401	0.085	0.085	3.115	3.35	0.0336	55.54
2.900	35.996	35.996	7.365	7.365	3.115	3.34	0.0361	49.78
3.000	33.651	33.651	6.763	6.763	3.115	3.34	0.0372	46.83
3.100	34.435	34.434	6.231	6.231	3.115	3.35	0.0339	49.57
3.200	29.410	29.409	5.865	5.865	3.115	3.16	0.0376	44.64
3.300	22.361	22.360	5.352	5.352	3.115	3.32	0.0424	37.45
3.400	19.253	19.252	4.955	4.955	3.115	3.32	0.0423	36.48
3.500	14.911	14.909	4.567	4.567	3.115	3.33	0.0449	33.32
3.600	13.137	13.136	4.214	4.214	3.115	3.31	0.0420	34.73
3.700	12.662	12.661	3.847	3.846	3.115	3.30	0.0346	41.04
3.800	11.259	11.258	3.437	3.437	3.115	3.33	0.0295	46.67
3.900	9.311	9.310	3.037	3.037	3.115	3.32	0.0284	47.35
4.000	7.843	7.843	2.591	2.591	3.115	3.34	0.0275	47.56

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AS 49-C2

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.200	34.994	34.995	1.775	1.775	3.155	3.24	0.0288	83.68
2.300	32.621	32.623	1.340	1.340	3.155	3.19	0.0304	76.33
2.400	38.726	38.727	0.930	0.930	3.155	3.22	0.0283	78.25
2.450	35.359	35.360	0.775	0.775	3.155	3.23	0.0323	67.14
2.500	36.940	36.941	0.630	0.630	3.155	3.26	0.0323	65.59
2.600	35.892	35.893	0.390	0.390	3.155	3.30	0.0355	56.95
2.700	34.714	34.714	0.255	0.255	3.155	3.24	0.0367	53.48
2.800	37.975	37.976	0.055	0.055	3.155	3.33	0.0348	53.71
2.900	37.540	37.540	7.335	7.335	3.155	3.33	0.0344	52.45
3.000	33.075	33.075	6.723	6.723	3.155	3.34	0.0373	46.71
3.100	33.962	33.962	6.191	6.191	3.155	3.35	0.0335	50.22
3.200	27.990	27.988	5.725	5.725	3.155	3.33	0.0366	44.60
3.300	22.284	22.283	5.312	5.312	3.155	3.30	0.0408	39.04
3.400	17.783	17.781	4.905	4.905	3.155	3.31	0.0432	35.77
3.500	14.191	14.189	4.527	4.527	3.155	3.30	0.0449	33.47
3.600	13.122	13.121	4.164	4.164	3.155	3.28	0.0396	36.97
3.700	12.474	12.472	3.797	3.796	3.155	3.27	0.0333	42.89
3.800	11.053	11.052	3.387	3.386	3.155	3.28	0.0288	48.12
3.900	9.226	9.225	2.967	2.967	3.155	3.28	0.0274	49.38
4.000	7.971	7.970	2.531	2.531	3.155	3.29	0.0265	49.68

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AU A9-C3

FREQUENCY MHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
100.00	100.000	100.000	144.333	144.333	5.512	3.22	0.0000	0.00
150.00	100.000	100.000	93.738	93.738	5.512	11.86	0.0000	0.00
200.00	100.000	100.000	69.186	69.186	5.512	3.46	0.0000	0.00
250.00	100.000	100.000	53.976	53.976	5.512	3.85	0.0000	0.00
300.00	100.000	100.000	43.873	43.873	5.512	3.40	0.0000	0.00
350.00	26.000	25.999	36.419	36.418	5.512	3.72	0.3415	41.98
400.00	100.000	100.000	30.812	30.812	5.512	3.48	0.0000	0.00
450.00	95.000	94.998	26.398	26.398	5.512	3.33	0.0436	266.68
500.00	42.000	41.998	18.537	18.537	5.512	5.98	0.0174	448.71
400.00	59.500	59.499	30.852	30.852	5.512	3.42	0.1036	124.76
450.00	54.000	53.999	26.318	26.318	5.512	3.43	0.0725	157.90
500.00	42.000	41.998	22.748	22.748	5.512	3.25	0.0688	154.07
550.00	30.000	29.999	19.408	19.408	5.512	3.37	0.0616	153.43
600.00	24.000	23.999	16.661	16.661	5.512	3.33	0.0567	153.91
650.00	18.400	18.399	14.319	14.319	5.512	3.25	0.0583	139.83
700.00	14.600	14.599	12.088	12.088	5.512	3.25	0.0580	130.32
750.00	13.400	13.400	9.989	9.989	5.512	3.29	0.0523	134.10
800.00	12.300	12.300	8.198	8.198	5.512	3.30	0.0514	127.71
850.00	12.400	12.400	6.658	6.658	5.512	3.32	0.0491	125.59
900.00	12.000	12.000	5.403	5.403	5.512	3.32	0.0515	113.06
915.00	11.000	11.000	5.108	5.108	5.512	3.31	0.0568	101.05
950.00	11.600	11.600	4.478	4.478	5.512	3.28	0.0556	99.87
1000.00	12.600	12.600	3.858	3.858	5.512	3.18	0.0534	100.31
1100.00	14.700	14.700	3.068	3.068	5.512	2.91	0.0487	104.37
1200.00	13.300	13.300	2.098	2.098	5.512	2.89	0.0605	77.42

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 410-01

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	23.823	23.823	0.030	0.030	1.0150	3.68	0.0643	9.44
8.400	24.044	24.043	0.028	0.028	1.0150	3.52	0.0599	10.11
8.600	22.284	22.284	2.681	2.681	1.0150	3.61	0.0649	9.00
8.800	21.852	21.852	2.499	2.499	1.0150	3.71	0.0645	8.73
9.000	17.519	17.518	2.336	2.336	1.0150	3.80	0.0759	7.17
9.200	15.346	15.346	2.207	2.207	1.0150	3.76	0.0812	6.59
9.400	13.428	13.427	2.080	2.080	1.0150	3.79	0.0844	6.19
9.600	9.300	9.300	1.964	1.964	1.0150	3.81	0.1099	4.64
9.800	6.109	6.109	1.867	1.867	1.0150	3.79	0.1554	3.23
10.000	6.152	6.151	1.781	1.781	1.0150	3.71	0.1420	3.50
10.200	6.109	6.109	1.692	1.692	1.0150	3.67	0.1271	3.85
10.400	5.483	5.482	1.643	1.642	1.0150	3.49	0.1453	3.39
10.600	6.660	6.660	1.535	1.535	1.0150	3.55	0.0950	5.04
10.800	5.623	5.623	1.432	1.432	1.0150	3.61	0.0895	5.20
11.000	4.183	4.183	1.343	1.343	1.0150	3.63	0.0996	4.58
11.200	3.475	3.475	1.281	1.281	1.0150	3.57	0.1102	4.10
11.400	4.050	4.050	1.168	1.168	1.0150	3.57	0.0753	5.89
11.600	3.859	3.859	1.042	1.042	1.0150	3.61	0.0625	6.93
11.800	3.508	3.507	0.923	0.923	1.0150	3.63	0.0586	7.25
12.000	3.311	3.311	0.782	0.782	1.0150	3.66	0.0550	7.56
12.200	3.342	3.342	0.637	0.637	1.0150	3.71	0.0533	7.62

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A10-02

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	18.793	18.793	0.015	0.015	1.0150	3.76	0.0838	7.16
8.400	17.640	17.640	2.832	2.832	1.0150	3.84	0.0883	6.58
8.600	16.032	16.032	2.656	2.656	1.0150	3.75	0.0929	6.17
8.800	14.077	14.076	2.484	2.484	1.0150	3.79	0.1014	5.50
9.000	14.488	14.487	2.333	2.333	1.0150	3.82	0.0921	5.90
9.200	16.088	16.087	2.197	2.197	1.0150	3.83	0.0761	6.97
9.400	14.997	14.996	2.065	2.065	1.0150	3.88	0.0725	7.11
9.600	13.122	13.121	1.959	1.959	1.0150	3.83	0.0760	6.69
9.800	11.695	11.694	1.842	1.842	1.0150	3.87	0.0727	6.91
10.000	10.316	10.315	1.716	1.716	1.0150	3.97	0.0649	7.39
10.200	8.710	8.709	1.627	1.627	1.0150	3.91	0.0683	6.93
10.400	7.244	7.243	1.528	1.527	1.0150	3.91	0.0686	6.77
10.600	5.943	5.942	1.435	1.435	1.0150	3.88	0.0711	6.43
10.800	4.819	4.819	1.317	1.317	1.0150	3.92	0.0680	6.57
11.000	4.050	4.050	1.218	1.218	1.0150	3.90	0.0682	6.45
11.200	3.459	3.459	1.106	1.106	1.0150	3.89	0.0669	6.46
11.400	3.144	3.144	0.993	0.993	1.0150	3.87	0.0639	6.66
11.600	2.985	2.985	0.882	0.882	1.0150	3.85	0.0613	6.84
11.800	2.917	2.917	0.753	0.753	1.0150	3.85	0.0593	6.96
12.000	2.985	2.985	0.625	0.625	1.0150	3.86	0.0588	6.89
12.200	3.225	3.225	0.507	0.507	1.0150	3.88	0.0595	6.68

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A10-03P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	18.344	18.344	3.030	3.030	1.0150	3.97	0.0898	6.51
8.400	17.022	17.021	2.805	2.805	1.0150	4.02	0.0932	6.08
8.600	15.977	15.977	2.621	2.621	1.0150	4.00	0.0938	5.92
8.800	14.588	14.588	2.449	2.449	1.0150	4.04	0.0953	5.67
9.000	12.274	12.274	2.288	2.288	1.0150	4.12	0.1013	5.16
9.200	11.455	11.454	2.162	2.162	1.0150	4.06	0.0995	5.18
9.400	9.462	9.462	2.030	2.030	1.0150	4.11	0.1038	4.83
9.600	7.656	7.655	1.909	1.909	1.0150	4.14	0.1092	4.48
9.800	6.761	6.760	1.802	1.802	1.0150	4.11	0.1068	4.50
10.000	5.882	5.881	1.676	1.676	1.0150	4.17	0.0949	4.93
10.200	4.759	4.758	1.562	1.562	1.0150	4.19	0.0935	4.89
10.400	3.516	3.515	1.443	1.442	1.0150	4.23	0.0977	4.57
10.600	2.723	2.722	1.345	1.345	1.0150	4.20	0.1059	4.15
10.800	2.336	2.336	1.222	1.222	1.0150	4.19	0.1004	4.30
11.000	2.056	2.056	1.113	1.113	1.0150	4.14	0.0998	4.28
11.200	2.018	2.018	0.941	0.941	1.0150	4.14	0.0865	4.84
11.400	2.089	2.089	0.758	0.758	1.0150	4.16	0.0783	5.24
11.600	2.344	2.344	0.622	0.622	1.0150	4.16	0.0728	5.55
11.800	2.723	2.723	0.500	0.500	1.0150	4.17	0.0702	5.65
12.000	3.170	3.170	0.395	0.395	1.0150	4.20	0.0716	5.43
12.200	3.681	3.682	0.340	0.340	1.0150	4.17	0.0697	5.50

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX 410-03PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	26.515	26.516	0.048	0.048	1.0200	3.56	0.0554	11.13
8.400	24.660	24.660	0.005	0.005	1.0200	3.63	0.0602	9.91
8.600	24.831	24.831	2.684	2.684	1.0200	3.56	0.0576	10.21
8.800	24.774	24.774	2.504	2.504	1.0200	3.64	0.0564	10.08
9.000	22.336	22.335	2.341	2.341	1.0200	3.73	0.0592	9.28
9.200	19.953	19.952	2.202	2.202	1.0200	3.76	0.0613	8.73
9.400	13.490	13.489	2.072	2.072	1.0200	3.80	0.0820	6.35
9.600	7.718	7.717	1.984	1.984	1.0200	3.66	0.1417	3.68
9.800	10.375	10.375	1.892	1.892	1.0200	3.57	0.0968	5.33
10.000	11.668	11.667	1.771	1.771	1.0200	3.68	0.0711	7.00
10.200	9.761	9.760	1.672	1.672	1.0200	3.69	0.0733	6.65
10.400	6.383	6.382	1.578	1.577	1.0200	3.71	0.0953	5.01
10.600	5.922	5.922	1.520	1.520	1.0200	3.58	0.1003	4.75
10.800	5.821	5.820	1.417	1.417	1.0200	3.61	0.0818	5.69
11.000	4.360	4.360	1.333	1.333	1.0200	3.61	0.0927	4.93
11.200	4.786	4.786	1.281	1.281	1.0200	3.49	0.0823	5.55
11.400	6.152	6.151	1.148	1.148	1.0200	3.55	0.0476	9.34
11.600	6.039	6.039	1.037	1.037	1.0200	3.57	0.0400	10.89
11.800	5.200	5.200	0.908	0.908	1.0200	3.60	0.0389	10.96
12.000	4.335	4.335	0.775	0.775	1.0200	3.64	0.0419	9.95
12.200	3.548	3.548	0.672	0.672	1.0200	3.63	0.0504	8.14

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A10-04P

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	19.476	19.476	0.033	0.033	1.0100	3.69	0.0788	7.69
8.400	18.793	18.793	0.008	0.008	1.0100	3.66	0.0799	7.43
8.600	18.493	18.494	0.485	0.485	1.0100	2.12	0.0309	24.64
8.800	18.302	18.302	2.506	2.506	1.0100	3.69	0.0777	7.27
9.000	16.788	16.787	2.348	2.348	1.0100	3.75	0.0805	6.80
9.200	15.631	15.631	2.222	2.222	1.0100	3.70	0.0817	6.61
9.400	14.355	14.354	2.095	2.095	1.0100	3.73	0.0817	6.44
9.600	13.521	13.520	1.994	1.994	1.0100	3.66	0.0814	6.39
9.800	11.803	11.802	1.872	1.872	1.0100	3.75	0.0802	6.27
10.000	10.471	10.470	1.756	1.756	1.0100	3.83	0.0751	6.50
10.200	8.913	8.912	1.667	1.667	1.0100	3.79	0.0786	6.12
10.400	7.286	7.285	1.583	1.582	1.0100	3.75	0.0852	5.56
10.600	6.317	6.316	1.490	1.490	1.0100	3.75	0.0830	5.60
10.800	5.495	5.495	1.387	1.387	1.0100	3.78	0.0766	5.94
11.000	4.694	4.693	1.293	1.293	1.0100	3.77	0.0746	6.00
11.200	4.074	4.073	1.186	1.186	1.0100	3.78	0.0699	6.28
11.400	3.556	3.556	1.068	1.068	1.0100	3.79	0.0653	6.58
11.600	3.221	3.221	0.962	0.962	1.0100	3.78	0.0633	6.69
11.800	2.996	2.996	0.838	0.838	1.0100	3.78	0.0610	6.82
12.000	2.996	2.996	0.717	0.717	1.0100	3.78	0.0584	7.00
12.200	3.210	3.210	0.587	0.587	1.0100	3.81	0.0561	7.15

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A10-04PP

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	25.763	25.764	0.093	0.093	1.0100	3.38	0.0526	12.04
8.400	26.853	26.854	0.053	0.053	1.0100	3.42	0.0515	11.94
8.600	27.164	27.164	0.040	0.040	1.0100	3.33	0.0492	12.36
8.800	26.699	26.699	0.000	2.596	1.0100	3.39	0.0506	11.63
9.000	23.659	23.659	2.401	2.401	1.0100	3.42	0.0564	10.17
9.200	21.330	21.330	2.267	2.267	1.0100	3.42	0.0605	9.27
9.400	20.725	20.725	2.147	2.147	1.0100	3.41	0.0596	9.22
9.600	19.543	19.543	2.047	2.047	1.0100	3.34	0.0604	9.00
9.800	19.055	19.054	1.932	1.932	1.0100	3.41	0.0573	9.21
10.000	17.478	17.477	1.816	1.816	1.0100	3.51	0.0549	9.28
10.200	15.346	15.345	1.727	1.727	1.0100	3.49	0.0569	8.81
10.400	12.882	12.881	1.638	1.637	1.0100	3.49	0.0600	8.19
10.600	10.580	10.579	1.560	1.560	1.0100	3.45	0.0662	7.32
10.800	9.739	9.738	1.482	1.482	1.0100	3.43	0.0638	7.49
11.000	9.311	9.310	1.406	1.406	1.0100	3.41	0.0587	8.01
11.200	9.141	9.140	1.316	1.316	1.0100	3.43	0.0497	9.27
11.400	8.995	8.994	1.248	1.248	1.0100	3.38	0.0453	10.06
11.600	8.511	8.510	1.132	1.132	1.0100	3.45	0.0366	12.10
11.800	7.568	7.567	1.036	1.036	1.0100	3.46	0.0346	12.55
12.000	6.660	6.660	0.922	0.922	1.0100	3.49	0.0329	12.95
12.200	6.067	6.067	0.817	0.817	1.0100	3.50	0.0323	12.94

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A10-C1

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	3.556	3.556	0.165	0.165	1.3550	1.93	0.2296	3.68
8.400	7.311	7.311	0.060	0.060	1.3550	2.16	0.1274	6.08
8.600	10.617	10.617	2.659	2.659	1.3550	2.31	0.0930	7.85
8.800	13.756	13.756	2.436	2.436	1.3550	2.45	0.0695	9.99
9.000	14.571	14.571	2.253	2.253	1.3550	2.51	0.0599	11.19
9.200	15.276	15.275	2.089	2.089	1.3550	2.55	0.0502	12.93
9.400	13.772	13.771	1.932	1.932	1.3550	2.60	0.0471	13.38
9.600	12.912	12.911	1.784	1.784	1.3550	2.62	0.0416	14.74
9.800	10.940	10.938	1.634	1.634	1.3550	2.66	0.0395	15.13
10.000	9.683	9.682	1.491	1.491	1.3550	2.67	0.0363	16.09
10.200	8.185	8.184	1.329	1.329	1.3550	2.70	0.0339	16.81
10.400	7.112	7.111	1.181	1.180	1.3550	2.71	0.0328	16.99
10.600	6.259	6.259	1.025	1.025	1.3550	2.72	0.0326	16.75
10.800	5.868	5.868	0.867	0.867	1.3550	2.74	0.0323	16.54
11.000	5.888	5.889	0.731	0.731	1.3550	2.74	0.0323	16.24
11.200	6.412	6.412	0.606	0.606	1.3550	2.75	0.0314	16.35
11.400	7.096	7.096	0.493	0.493	1.3550	2.77	0.0316	15.91
11.600	7.971	7.971	0.407	0.407	1.3550	2.78	0.0317	15.56
11.800	8.892	8.893	0.331	0.331	1.3550	2.79	0.0325	14.89
12.000	9.851	9.852	0.277	0.277	1.3550	2.79	0.0327	14.53
12.200	11.220	11.221	0.222	0.222	1.3550	2.81	0.0325	14.35

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A10-C2

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	4.325	4.325	0.100	0.100	1.3900	2.02	0.2085	3.95
8.400	8.147	8.147	0.005	0.005	1.3900	2.21	0.1191	6.43
8.600	11.246	11.246	2.614	2.614	1.3900	2.34	0.0866	8.37
8.800	14.012	14.011	2.399	2.399	1.3900	2.44	0.0647	10.73
9.000	14.588	14.587	2.213	2.213	1.3900	2.50	0.0550	12.18
9.200	14.774	14.773	2.049	2.049	1.3900	2.53	0.0470	13.88
9.400	13.474	13.473	1.892	1.892	1.3900	2.56	0.0431	14.70
9.600	11.817	11.816	1.734	1.734	1.3900	2.60	0.0397	15.54
9.800	10.268	10.267	1.579	1.579	1.3900	2.62	0.0366	16.43
10.000	8.985	8.984	1.431	1.431	1.3900	2.63	0.0343	17.18
10.200	7.691	7.690	1.274	1.274	1.3900	2.64	0.0329	17.52
10.400	6.738	6.737	1.108	1.107	1.3900	2.66	0.0317	17.76
10.600	6.180	6.180	0.950	0.950	1.3900	2.67	0.0314	17.56
10.800	5.991	5.991	0.802	0.802	1.3900	2.68	0.0315	17.15
11.000	6.216	6.216	0.671	0.671	1.3900	2.68	0.0314	16.86
11.200	6.894	6.895	0.544	0.544	1.3900	2.70	0.0311	16.69
11.400	7.727	7.727	0.453	0.453	1.3900	2.70	0.0309	16.50
11.600	8.790	8.791	0.367	0.367	1.3900	2.72	0.0310	16.08
11.800	9.829	9.830	0.301	0.301	1.3900	2.73	0.0314	15.60
12.000	10.789	10.790	0.242	0.242	1.3900	2.75	0.0324	14.80
12.200	11.790	11.790	0.197	0.197	1.3900	2.75	0.0328	14.39

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AS A10-C3

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.200	36.983	36.984	2.245	2.245	3.155	3.04	0.0212	117.23
2.300	32.081	32.083	1.840	1.840	3.155	2.92	0.0232	104.77
2.400	30.199	30.201	1.510	1.510	3.155	2.82	0.0251	94.24
2.450	30.726	30.727	1.325	1.325	3.155	2.81	0.0258	90.18
2.500	33.266	33.267	1.170	1.170	3.155	2.79	0.0247	92.50
2.600	31.623	31.624	0.910	0.910	3.155	2.75	0.0278	79.58
2.700	28.216	28.217	0.735	0.735	3.155	2.69	0.0321	67.04
2.800	26.333	26.334	0.515	0.515	3.155	2.70	0.0371	55.83
2.900	25.468	25.469	0.315	0.315	3.155	2.73	0.0411	48.44
3.000	19.588	19.589	0.135	0.135	3.155	2.78	0.0561	34.01
3.100	16.730	16.730	0.421	0.421	3.155	2.94	0.0687	26.18
3.200	12.764	12.764	5.825	5.825	3.155	3.15	0.0854	19.68
3.300	9.649	9.649	5.242	5.242	3.155	3.43	0.0890	17.58
3.400	7.430	7.429	4.655	4.655	3.155	3.66	0.0757	19.41
3.500	6.102	6.102	4.087	4.087	3.155	3.77	0.0602	23.36
3.600	6.033	6.032	3.544	3.544	3.155	3.78	0.0436	31.28
3.700	6.745	6.745	3.032	3.031	3.155	3.76	0.0310	42.93
3.800	7.551	7.550	2.597	2.596	3.155	3.71	0.0247	52.82
3.900	8.780	8.780	2.247	2.247	3.155	3.63	0.0206	62.45
4.000	10.186	10.186	1.981	1.981	3.155	3.54	0.0180	70.53

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. A5 A10-C4

FREQUENCY GHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.200	36.058	36.059	11.200	11.199	4.240	1.50	0.0065	542.48
2.300	31.117	31.117	0.805	0.805	4.240	2.52	0.0351	74.60
2.400	31.769	31.770	0.995	0.995	4.240	2.22	0.0256	104.21
2.450	31.690	31.676	0.300	0.300	4.240	2.53	0.0355	69.03
2.500	33.051	33.052	0.135	0.135	4.240	2.57	0.0339	70.33
2.600	30.374	30.373	9.468	9.468	4.240	2.60	0.0367	62.09
2.700	26.838	26.837	8.385	8.385	4.240	2.58	0.0386	57.07
2.800	27.956	27.956	7.438	7.438	4.240	2.62	0.0327	64.44
2.900	23.578	23.576	6.680	6.680	4.240	2.61	0.0332	61.43
3.000	18.535	18.534	5.988	5.988	4.240	2.61	0.0344	57.22
3.100	16.181	16.179	5.336	5.336	4.240	2.61	0.0308	61.87
3.200	12.589	12.588	4.730	4.730	4.240	2.60	0.0308	60.04
3.300	9.484	9.483	4.137	4.137	4.240	2.58	0.0320	56.18
3.400	7.577	7.576	3.530	3.530	4.240	2.57	0.0321	54.48
3.500	6.412	6.412	2.932	2.932	4.240	2.57	0.0327	52.07
3.600	6.383	6.383	2.409	2.409	4.240	2.55	0.0313	53.03
3.700	7.055	7.055	1.912	1.911	4.240	2.54	0.0294	55.11
3.800	7.925	7.926	1.472	1.471	4.240	2.55	0.0293	53.73
3.900	8.933	8.934	1.152	1.152	4.240	2.54	0.0298	51.48

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AU A10-C5

FREQUENCY MHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
100.00	100.000	100.000	142.105	142.105	7.440	6.60	0.0000	0.00
150.00	100.000	100.000	92.180	92.180	7.440	3.22	0.0000	0.00
200.00	100.000	100.000	67.078	67.078	7.440	2.71	0.0000	0.00
250.00	100.000	100.000	51.510	51.510	7.440	3.39	0.0000	0.00
300.00	100.000	100.000	41.645	41.645	7.440	2.50	0.0000	0.00
350.00	40.000	39.999	34.010	34.010	7.440	2.66	0.1271	131.86
400.00	65.000	64.999	28.204	28.204	7.440	2.63	0.0494	298.07
450.00	40.000	39.998	23.390	23.390	7.440	2.68	0.0507	255.90
500.00	34.000	33.999	19.539	19.539	7.440	2.62	0.0429	274.74
500.00	20.800	20.799	19.220	19.220	7.440	2.75	0.0638	180.46
550.00	13.800	13.799	16.150	16.150	7.440	2.63	0.0777	137.86
600.00	12.500	12.500	13.573	13.573	7.440	2.52	0.0727	137.86
650.00	11.300	11.300	11.070	11.070	7.440	2.53	0.0676	136.67
700.00	10.830	10.830	8.840	8.840	7.440	2.55	0.0632	135.13
750.00	12.330	12.330	6.910	6.910	7.440	2.60	0.0533	148.25
800.00	12.200	12.200	5.830	5.830	7.440	2.50	0.0547	137.99
850.00	11.600	11.600	4.430	4.430	7.440	2.56	0.0600	116.81
900.00	14.400	14.400	3.510	3.510	7.440	2.56	0.0512	129.67
915.00	14.700	14.700	3.510	3.510	7.440	2.47	0.0498	133.21
950.00	14.000	14.000	2.900	2.900	7.440	2.49	0.0550	115.77
1000.00	16.500	16.500	2.540	2.540	7.440	2.37	0.0476	130.29
1100.00	16.300	16.300	1.580	1.580	7.440	2.32	0.0526	108.43
1200.00	15.000	15.000	0.630	0.630	7.440	2.39	0.0639	80.53

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AU A11-C1

FREQUENCY MHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
100.00	100.000	100.000	144.775	144.775	5.080	3.32	0.0000	0.00
150.00	100.000	100.000	94.690	94.690	5.080	4.66	0.0000	0.00
200.00	100.000	100.000	68.618	68.618	5.080	13.73	0.0000	0.00
250.00	100.000	100.000	54.428	54.428	5.080	4.46	0.0000	0.00
300.00	89.000	87.998	44.375	44.375	5.080	3.74	0.2284	72.51
350.00	63.000	62.999	36.980	36.980	5.080	3.89	0.1760	78.66
400.00	48.000	47.998	31.364	31.364	5.080	3.85	0.1436	84.89
450.00	47.000	46.998	26.850	26.850	5.080	3.86	0.0926	116.57
500.00	54.000	53.998	23.139	23.139	5.080	3.82	0.0541	180.70
400.00	50.000	49.998	31.134	31.134	5.080	4.34	0.1129	101.59
450.00	53.000	52.998	26.960	26.960	5.080	3.68	0.0894	123.74
500.00	40.700	40.698	23.230	23.230	5.080	3.72	0.0757	130.89
550.00	31.000	30.998	19.830	19.830	5.080	3.91	0.0607	144.63
600.00	23.000	22.999	17.153	17.153	5.080	3.79	0.0615	133.03
650.00	18.000	17.999	14.701	14.701	5.080	3.74	0.0592	128.29
700.00	14.000	13.999	12.334	12.334	5.080	3.77	0.0579	121.28
750.00	12.430	12.430	10.270	10.270	5.080	3.76	0.0544	120.63
800.00	11.350	11.350	8.360	8.360	5.080	3.79	0.0530	115.72
850.00	11.600	11.600	6.760	6.760	5.080	3.80	0.0500	115.23
900.00	11.200	11.200	5.460	5.460	5.080	3.80	0.0529	102.77
950.00	12.050	12.050	5.170	5.170	5.080	3.78	0.0498	107.66
950.00	11.600	11.600	4.590	4.590	5.080	3.71	0.0536	97.35
1000.00	11.900	11.900	3.890	3.890	5.080	3.63	0.0551	90.93
1100.00	14.000	14.000	2.810	2.810	5.080	3.48	0.0527	88.35
1200.00	12.600	12.600	1.710	1.710	5.080	3.58	0.0711	59.17

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AU A12-C1

FREQUENCY MHZ	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
100.00	100.000	100.000	144.977	144.977	4.928	0.71	0.0000	0.00
150.00	100.000	100.000	94.822	94.822	4.928	5.48	0.0000	0.00
200.00	100.000	100.000	69.760	69.760	4.928	4.55	0.0000	0.00
250.00	100.000	100.000	54.760	54.760	4.928	3.36	0.0000	0.00
300.00	100.000	100.000	44.517	44.517	4.928	4.00	0.0000	0.00
350.00	38.000	37.999	37.239	37.239	4.928	3.83	0.3337	42.32
400.00	35.000	35.999	31.626	31.626	4.928	3.85	0.2148	56.91
450.00	42.000	41.999	26.912	26.912	4.928	4.26	0.0981	104.88
500.00	40.050	40.049	23.211	23.211	4.928	4.15	0.0701	133.80
400.00	63.000	62.998	31.396	31.396	4.928	4.37	0.0998	114.59
450.00	45.000	44.998	26.482	26.482	4.928	4.92	0.0693	138.11
500.00	43.100	43.098	23.442	23.442	4.928	3.86	0.0751	129.43
550.00	33.000	32.998	20.162	20.162	4.928	3.97	0.0627	139.06
600.00	24.000	23.999	17.445	17.445	4.928	3.89	0.0627	128.71
650.00	18.400	18.399	15.012	15.012	4.928	3.84	0.0612	122.50
700.00	14.700	14.699	12.702	12.702	4.928	3.86	0.0581	119.53
750.00	12.600	12.600	10.642	10.642	4.928	3.85	0.0565	116.82
800.00	11.700	11.700	8.802	8.802	4.928	3.84	0.0526	115.67
850.00	11.500	11.500	7.072	7.072	4.928	3.89	0.0501	113.58
900.00	10.150	10.150	5.822	5.822	4.928	3.85	0.0573	94.28
915.00	11.400	11.400	5.412	5.412	4.928	3.88	0.0516	102.70
950.00	11.050	11.050	4.862	4.862	4.928	3.78	0.0548	94.31
1000.00	10.500	10.500	3.982	3.982	4.928	3.76	0.0614	80.15
1100.00	11.700	11.700	2.952	2.952	4.928	3.57	0.0614	74.86
1200.00	15.800	15.800	1.842	1.842	4.928	3.67	0.0550	75.55

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AS A4-01P

FREQUENCY CM	TEMP CELSIUS	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATIO DEPTH CM
2.200	50.00	1.115	41.108	20.345	20.345	2.4060	12.10	0.1028	12.15
2.200	100.00	.763	25.761	0.024	0.024	2.4060	8.45	0.1970	7.61
2.200	150.00	[illegible]	20.533	20.595	20.595	2.4060	9.70	0.2810	5.00
2.200	200.00	[illegible]	22.027	20.585	20.585	2.4060	9.85	0.2571	5.42
2.200	250.00	[illegible]	52.357	0.434	0.434	2.4060	6.73	0.0645	25.96
2.200	300.00	[illegible]	45.708	1.204	1.204	2.4060	5.12	0.0360	53.27
2.500	50.00	[illegible]	30.269	0.134	0.134	2.4060	6.23	0.0779	19.65
2.500	100.00	1.227	21.827	0.154	0.154	2.4060	6.11	0.1065	14.52
2.500	150.00	[illegible]	16.032	0.154	0.154	2.4060	6.04	0.1458	10.68
2.500	200.00	[illegible]	15.381	0.064	0.064	2.4060	6.41	0.1648	9.18
2.500	250.00	[illegible]	44.721	0.444	0.444	2.4060	5.20	0.0393	42.64
2.500	300.00	[illegible]	42.257	0.294	0.294	2.4060	5.64	0.0481	33.39
3.000	50.00	[illegible]	19.097	6.522	6.522	2.4060	6.50	0.0754	16.57
3.000	100.00	[illegible]	12.288	6.572	6.572	2.4060	6.30	0.1266	10.03
3.000	150.00	[illegible]	9.959	6.512	6.512	2.4060	6.60	0.1446	8.58
3.000	200.00	[illegible]	8.599	6.442	6.442	2.4060	6.95	0.1495	8.09
3.000	250.00	[illegible]	30.619	6.662	6.662	2.4060	5.87	0.0539	24.38
3.000	300.00	[illegible]	26.393	6.762	6.762	2.4060	5.43	0.0651	20.96
3.500	50.00	[illegible]	5.247	4.346	4.346	2.4060	6.22	0.0796	13.74
3.500	100.00	[illegible]	3.447	4.336	4.336	2.4060	6.37	0.1111	9.74
3.500	150.00	[illegible]	2.366	4.316	4.316	2.4060	6.63	0.1359	7.81
3.500	200.00	1.991	1.990	4.396	4.396	2.4060	6.77	0.1556	6.76
3.500	250.00	[illegible]	8.579	4.366	4.366	2.4060	6.12	0.0519	21.25
3.500	300.00	[illegible]	5.507	4.346	4.346	2.4060	6.21	0.0762	14.36
4.000	50.00	[illegible]	2.986	1.134	1.134	2.4060	6.37	0.0686	13.78
4.000	100.00	[illegible]	2.589	0.954	0.954	2.4060	6.46	0.0910	10.32
4.000	150.00	[illegible]	2.541	0.764	0.764	2.4060	6.60	0.1123	8.28
4.000	200.00	[illegible]	2.541	0.654	0.654	2.4060	6.68	0.1280	7.23
4.000	250.00	[illegible]	3.590	1.424	1.424	2.4060	6.19	0.0475	20.19
4.000	300.00	[illegible]	3.084	1.314	1.314	2.4060	6.25	0.0587	16.27

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A4-02P

FREQUENCY GHZ	TEMP CELSIUS	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	50.00	12.023	12.021	2.777	2.777	1.0100	5.94	0.0794	6.02
8.200	100.00	10.965	10.963	2.777	2.777	1.0100	5.95	0.0868	5.50
8.200	150.00	11.350	11.348	2.757	2.757	1.0100	6.05	0.0768	6.16
8.200	200.00	15.311	15.308	2.737	2.737	1.0100	6.13	0.0526	8.94
8.200	250.00	15.136	15.133	2.737	2.737	1.0100	6.13	0.0532	8.84
8.200	300.00	6.095	6.094	2.647	2.647	1.0100	6.64	0.0845	5.35
9.000	50.00	3.758	3.758	1.773	1.773	1.0100	6.09	0.0529	8.13
9.000	100.00	3.255	3.254	1.853	1.853	1.0100	6.00	0.0717	6.04
9.000	150.00	3.715	3.715	1.833	1.833	1.0100	6.00	0.0612	7.08
9.000	200.00	5.158	5.157	1.903	1.903	1.0100	5.84	0.0550	7.99
9.000	250.00	5.623	5.622	1.903	1.903	1.0100	5.83	0.0508	8.65
9.000	300.00	2.054	2.053	1.853	1.853	1.0100	6.17	0.0986	4.33
10.000	50.00	3.350	3.350	0.410	0.410	1.0100	6.11	0.0705	5.48
10.000	100.00	2.818	2.819	0.410	0.410	1.0100	6.06	0.0818	4.74
10.000	150.00	2.541	2.541	0.480	0.480	1.0100	5.94	0.0772	5.08
10.000	200.00	2.723	2.723	0.510	0.510	1.0100	5.92	0.0687	5.71
10.000	250.00	2.901	2.901	0.570	0.570	1.0100	5.85	0.0587	6.72
10.000	300.00	2.371	2.372	0.290	0.290	1.0100	6.14	0.1261	3.06
11.000	50.00	10.292	10.293	0.240	0.240	1.0100	5.60	0.0382	9.61
11.000	100.00	6.683	6.684	0.130	0.130	1.0100	6.10	0.0937	3.75
11.000	150.00	7.079	7.080	0.130	0.130	1.0100	6.11	0.0886	3.96
11.000	200.00	7.499	7.500	0.130	0.130	1.0100	6.12	0.0838	4.19
11.000	250.00	8.414	8.415	0.150	0.150	1.0100	6.02	0.0682	5.18
11.000	300.00	5.888	5.889	0.080	0.080	1.0100	6.41	0.1357	2.53
12.000	50.00	11.749	11.749	0.050	0.050	1.0100	5.82	0.0680	4.85
12.000	100.00	10.471	10.471	0.020	0.020	1.0100	6.13	0.0845	3.80
12.000	150.00	10.965	10.966	0.020	0.020	1.0100	6.14	0.0806	3.99
12.000	200.00	11.092	11.092	0.000	1.492	1.0100	6.38	0.0829	3.80
12.000	250.00	13.490	13.490	0.010	0.010	1.0100	6.27	0.0665	4.78
12.000	300.00	8.913	8.912	1.462	1.462	1.0100	6.78	0.1055	2.90

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A4-05PP

FREQUENCY GHZ	TEMP CELSIUS	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	50.00	18.729	18.729	2.709	2.709	1.0075	6.28	0.0383	12.13
8.200	100.00	15.136	15.133	2.779	2.779	1.0075	5.93	0.0641	7.46
8.200	150.00	13.490	13.488	2.759	2.759	1.0075	6.05	0.0657	7.21
8.200	200.00	19.724	19.721	2.769	2.769	1.0075	5.97	0.0473	10.08
8.200	250.00	20.654	20.651	2.769	2.769	1.0075	5.97	0.0452	10.55
8.200	300.00	11.482	11.480	2.719	2.719	1.0075	6.27	0.0643	7.23
9.000	50.00	7.852	7.851	1.865	1.865	1.0075	5.90	0.0332	13.15
9.000	100.00	5.957	5.955	1.905	1.905	1.0075	5.84	0.0484	9.06
9.000	150.00	5.689	5.687	1.845	1.845	1.0075	5.96	0.0428	10.16
9.000	200.00	9.226	9.224	1.935	1.935	1.0075	5.75	0.0350	12.63
9.000	250.00	10.351	10.349	1.935	1.935	1.0075	5.74	0.0313	14.13
9.000	300.00	4.365	4.364	1.885	1.885	1.0075	5.92	0.0606	7.19
10.000	50.00	3.868	3.869	0.693	0.692	1.0075	5.75	0.0379	10.49
10.000	100.00	3.447	3.448	0.623	0.622	1.0075	5.83	0.0461	8.58
10.000	150.00	3.162	3.163	0.663	0.662	1.0075	5.77	0.0478	8.32
10.000	200.00	3.868	3.869	0.763	0.762	1.0075	5.66	0.0358	11.22
10.000	250.00	4.217	4.217	0.813	0.812	1.0075	5.61	0.0319	12.65
10.000	300.00	2.441	2.441	0.602	0.602	1.0075	5.81	0.0659	6.01
11.000	50.00	9.661	9.662	0.222	0.222	1.0075	5.69	0.0435	8.36
11.000	100.00	8.760	8.761	0.213	0.212	1.0075	5.73	0.0499	7.27
11.000	150.00	8.318	8.317	0.193	0.192	1.0075	5.82	0.0571	6.30
11.000	200.00	9.016	9.017	0.203	0.202	1.0075	5.78	0.0506	7.14
11.000	250.00	10.116	10.117	0.233	0.232	1.0075	5.65	0.0400	9.13
11.000	300.00	6.531	6.532	0.163	0.162	1.0075	5.93	0.0823	4.33
12.000	50.00	15.136	15.137	0.083	0.082	1.0075	5.58	0.0463	7.28
12.000	100.00	13.335	13.336	0.063	0.062	1.0075	5.74	0.0571	5.81
12.000	150.00	13.183	13.183	0.063	0.062	1.0075	5.74	0.0578	5.75
12.000	200.00	14.454	14.455	0.053	0.052	1.0075	5.84	0.0548	6.01
12.000	250.00	16.788	16.789	0.063	0.062	1.0075	5.75	0.0453	7.32
12.000	300.00	10.715	10.715	0.033	0.032	1.0075	6.02	0.0797	4.07

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AS A7-01P

FREQUENCY GHZ	TEMP CELSIUS	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
2.200	50.00	7.345	7.346	3.215	3.215	2.2250	4.24	0.0696	30.29
2.200	100.00	5.977	5.977	1.875	1.875	2.2250	4.67	0.1557	12.92
2.200	150.00	5.957	5.957	1.515	1.515	2.2250	4.84	0.1933	10.25
2.200	200.00	7.055	7.055	2.665	2.665	2.2250	4.41	0.0907	22.78
2.200	250.00	5.848	5.848	2.975	2.975	2.2250	4.27	0.0942	22.29
2.200	300.00	6.630	6.630	1.865	1.865	2.2250	4.73	0.1440	13.89
2.500	50.00	13.047	13.047	1.095	1.095	2.2250	4.47	0.0770	23.45
2.500	100.00	9.247	9.247	0.925	0.925	2.2250	4.64	0.1239	14.33
2.500	150.00	8.872	8.872	0.955	0.955	2.2250	4.59	0.1257	14.21
2.500	200.00	11.858	11.858	1.125	1.125	2.2250	4.42	0.0827	21.98
2.500	250.00	11.548	11.548	1.215	1.215	2.2250	4.32	0.0793	23.19
2.500	300.00	7.825	7.825	0.845	0.845	2.2250	4.70	0.1557	11.34
3.000	50.00	18.260	18.260	0.225	0.225	2.2250	4.62	0.0832	17.80
3.000	100.00	12.531	12.532	0.185	0.185	2.2250	4.70	0.1265	11.62
3.000	150.00	11.641	11.641	0.155	0.155	2.2250	4.79	0.1404	10.38
3.000	200.00	16.255	16.256	0.215	0.215	2.2250	4.64	0.0944	15.65
3.000	250.00	15.524	15.524	0.355	0.355	2.2250	4.24	0.0860	17.98
3.000	300.00	9.333	9.333	0.105	0.105	2.2250	4.90	0.1851	7.80
3.500	50.00	18.902	18.902	5.197	5.197	2.2250	4.49	0.0770	16.71
3.500	100.00	15.740	15.740	5.187	5.187	2.2250	4.53	0.0929	13.80
3.500	150.00	11.722	11.722	5.147	5.147	2.2250	4.68	0.1257	10.05
3.500	200.00	17.681	17.681	5.227	5.227	2.2250	4.38	0.0922	15.87
3.500	250.00	14.689	14.689	5.317	5.317	2.2250	4.04	0.0960	14.14
3.500	300.00	9.462	9.462	5.167	5.167	2.2250	4.57	0.1587	8.06
4.000	50.00	15.170	15.169	3.901	3.901	2.2250	4.57	0.0572	19.53
4.000	100.00	9.977	9.976	3.861	3.861	2.2250	4.70	0.0810	13.59
4.000	150.00	8.831	8.830	3.861	3.861	2.2250	4.71	0.0916	12.02
4.000	200.00	16.558	16.557	3.961	3.961	2.2250	4.39	0.0577	19.73
4.000	250.00	13.474	13.473	4.061	4.061	2.2250	4.08	0.0812	14.56
4.000	300.00	4.581	4.581	3.901	3.901	2.2250	4.73	0.1903	5.79

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A7-02P

FREQUENCY GHZ	TEMP CELSIUS	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	50.00	18.880	18.880	0.109	0.109	0.9910	3.39	0.0707	8.94
8.200	100.00	17.055	19.055	0.119	0.119	0.9910	3.35	0.0684	9.30
8.200	150.00	26.699	26.700	0.119	0.119	0.9910	3.36	0.0488	13.01
8.200	200.00	19.521	19.521	0.149	0.149	0.9910	3.22	0.0622	10.43
8.200	250.00	18.621	18.621	0.099	0.099	0.9910	3.44	0.0734	8.56
8.200	300.00	6.237	6.237	2.976	2.976	0.9910	4.34	0.3316	1.71
9.000	50.00	20.253	20.253	2.382	2.382	0.9910	3.66	0.0684	8.11
9.000	100.00	20.045	20.045	2.432	2.432	0.9910	3.35	0.0661	8.77
9.000	150.00	30.269	30.268	2.382	2.382	0.9910	3.66	0.0455	12.17
9.000	200.00	30.974	30.974	0.009	0.009	0.9910	3.30	0.0420	13.89
9.000	250.00	18.836	18.836	2.412	2.412	0.9910	3.47	0.0721	7.90
9.000	300.00	5.689	5.688	2.322	2.322	0.9910	4.05	0.2687	1.98
10.000	50.00	18.408	18.407	1.905	1.905	0.9910	3.13	0.0615	8.78
10.000	100.00	17.968	17.967	1.885	1.885	0.9910	3.24	0.0621	8.53
10.000	150.00	29.751	29.750	1.895	1.895	0.9910	3.19	0.0376	14.20
10.000	200.00	31.261	31.260	1.895	1.895	0.9910	3.19	0.0358	14.92
10.000	250.00	14.125	14.125	1.875	1.875	0.9910	3.30	0.0785	6.69
10.000	300.00	4.340	4.340	1.805	1.805	0.9910	3.85	0.2294	2.13
11.000	50.00	11.749	11.748	1.497	1.497	0.9910	3.17	0.0659	7.40
11.000	100.00	11.246	11.245	1.467	1.467	0.9910	3.30	0.0617	7.74
11.000	150.00	22.909	22.907	1.507	1.507	0.9910	3.11	0.0347	14.15
11.000	200.00	24.322	24.320	1.507	1.507	0.9910	3.11	0.0327	15.02
11.000	250.00	9.016	9.015	1.487	1.487	0.9910	3.22	0.0831	5.82
11.000	300.00	2.661	2.660	1.427	1.427	0.9910	3.74	0.2004	2.25
12.000	50.00	4.732	4.731	1.111	1.111	0.9910	3.27	0.0751	5.86
12.000	100.00	4.416	4.415	1.081	1.081	0.9910	3.34	0.0726	6.00
12.000	150.00	11.641	11.640	1.141	1.141	0.9910	3.17	0.0344	12.98
12.000	200.00	12.842	12.841	1.141	1.141	0.9910	3.16	0.0311	14.36
12.000	250.00	3.715	3.715	1.121	1.121	0.9910	3.27	0.0978	4.50
12.000	300.00	1.631	1.631	1.131	1.131	0.9910	3.53	0.1860	2.28

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A7-05PP

FREQUENCY GHZ	TEMP CELSIUS	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATION DEPTH CM
8.200	50.00	25.119	25.119	0.008	0.008	1.0120	3.84	0.0634	9.37
8.200	100.00	22.387	22.387	3.035	3.035	1.0120	3.96	0.0732	7.99
8.200	150.00	20.654	20.653	2.995	2.995	1.0120	4.25	0.0819	6.90
8.200	200.00	26.152	26.151	3.005	3.005	1.0120	4.18	0.0641	8.88
8.200	250.00	20.300	20.300	2.995	2.995	1.0120	4.25	0.0834	6.78
8.200	300.00	12.023	12.022	2.885	2.885	1.0120	5.15	0.1234	4.16
9.000	50.00	23.823	23.821	2.261	2.261	1.0120	4.32	0.0480	10.64
9.000	100.00	21.014	21.013	2.301	2.301	1.0120	4.05	0.0602	8.75
9.000	150.00	19.953	19.951	2.231	2.231	1.0120	4.51	0.0519	9.62
9.000	200.00	26.002	26.000	2.291	2.291	1.0120	4.12	0.0475	11.00
9.000	250.00	19.165	19.163	2.261	2.261	1.0120	4.32	0.0598	8.54
9.000	300.00	9.886	9.885	2.221	2.221	1.0120	4.60	0.1015	4.87
10.000	50.00	16.596	16.594	1.734	1.734	1.0120	3.90	0.0434	11.13
10.000	100.00	14.125	14.124	1.714	1.714	1.0120	3.99	0.0471	10.15
10.000	150.00	15.667	15.666	1.694	1.694	1.0120	4.07	0.0391	12.09
10.000	200.00	19.275	19.273	1.704	1.704	1.0120	4.03	0.0332	14.35
10.000	250.00	13.335	13.334	1.694	1.694	1.0120	4.07	0.0459	10.30
10.000	300.00	5.689	5.688	1.644	1.644	1.0120	4.31	0.0857	5.37
11.000	50.00	7.079	7.079	1.206	1.206	1.0120	3.91	0.0383	11.45
11.000	100.00	5.888	5.888	1.166	1.166	1.0120	3.99	0.0413	10.51
11.000	150.00	6.761	6.760	1.186	1.186	1.0120	3.95	0.0380	11.49
11.000	200.00	8.810	8.809	1.206	1.206	1.0120	3.91	0.0309	14.21
11.000	250.00	5.821	5.820	1.226	1.226	1.0120	3.88	0.0491	8.96
11.000	300.00	2.239	2.238	1.106	1.106	1.0120	4.16	0.0912	4.67
12.000	50.00	4.842	4.842	0.620	0.620	1.0120	3.90	0.0361	11.17
12.000	100.00	4.365	4.365	0.580	0.580	1.0120	3.95	0.0408	9.80
12.000	150.00	4.870	4.870	0.620	0.620	1.0120	3.90	0.0359	11.23
12.000	200.00	5.309	5.309	0.640	0.640	1.0120	3.87	0.0327	12.36
12.000	250.00	3.447	3.448	0.670	0.670	1.0120	3.83	0.0504	8.07
12.000	300.00	1.830	1.830	0.485	0.485	1.0120	4.01	0.1059	3.76

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A8-01A

FREQUENCY GHZ	TEMP CELSIUS	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATI DEPTH CM
8.200	50.00	10.116	10.115	2.837	2.837	1.0100	5.57	0.1227	4.02
8.200	100.00	6.839	6.838	2.817	2.817	1.0100	5.85	0.1633	2.96
8.200	150.00	5.309	5.308	2.767	2.767	1.0100	6.28	0.1566	2.97
8.200	200.00	4.898	4.896	2.457	2.457	1.0100	7.12	0.0550	7.93
8.200	250.00	10.116	10.114	2.737	2.737	1.0100	6.17	0.0784	5.98
8.200	300.00	22.131	22.128	2.747	2.747	1.0100	6.06	0.0382	12.37
9.000	50.00	4.467	4.466	1.993	1.993	1.0100	5.68	0.0827	5.38
9.000	100.00	3.073	3.072	2.063	2.063	1.0100	5.70	0.1370	3.25
9.000	150.00	2.661	2.660	2.043	2.043	1.0100	5.83	0.1371	3.21
9.000	200.00	2.738	2.738	2.073	2.073	1.0100	5.77	0.1490	2.97
9.000	250.00	6.494	6.493	2.013	2.013	1.0100	5.55	0.0639	7.05
9.000	300.00	14.454	14.452	2.053	2.053	1.0100	5.37	0.0345	13.25
10.000	50.00	1.259	1.259	0.970	0.970	1.0100	5.42	0.1067	3.85
10.000	100.00	1.202	1.202	0.210	0.210	1.0100	5.54	0.1519	2.68
10.000	150.00	1.413	1.413	0.040	0.040	1.0100	5.52	0.1924	2.12
10.000	200.00	1.349	1.349	0.020	0.020	1.0100	5.48	0.1858	2.20
10.000	250.00	2.239	2.238	1.276	1.276	1.0100	5.12	0.0749	5.63
10.000	300.00	4.898	4.897	1.276	1.276	1.0100	5.06	0.0355	11.95
11.000	50.00	3.255	3.255	0.260	0.260	1.0100	5.34	0.1045	3.60
11.000	100.00	2.985	2.986	0.160	0.160	1.0100	5.53	0.1634	2.27
11.000	150.00	2.738	2.739	0.100	0.100	1.0100	5.54	0.2262	1.64
11.000	200.00	2.661	2.661	0.080	0.080	1.0100	5.51	0.2529	1.47
11.000	250.00	2.585	2.586	0.320	0.320	1.0100	5.13	0.1055	3.64
11.000	300.00	4.121	4.122	0.430	0.430	1.0100	5.03	0.0528	7.33
12.000	50.00	5.754	5.755	0.110	0.110	1.0100	5.23	0.1067	3.26
12.000	100.00	4.732	4.732	0.060	0.060	1.0100	5.49	0.1655	2.06
12.000	150.00	4.097	4.097	0.030	0.030	1.0100	5.62	0.2258	1.50
12.000	200.00	4.842	4.842	0.000	1.492	1.0100	6.14	0.2141	1.51
12.000	250.00	5.309	5.309	0.090	0.090	1.0100	5.33	0.1271	2.72
12.000	300.00	7.586	7.586	0.120	0.120	1.0100	5.22	0.0777	4.48

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A10-02

FREQUENCY GHZ	TEMP CELSIUS	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATIO DEPTH CM
8.200	50.00	15.311	15.311	0.005	0.005	1.0150	3.81	0.1050	5.68
8.200	100.00	12.162	12.162	2.992	2.992	1.0150	4.21	0.1421	4.00
8.200	150.00	10.116	10.116	3.032	3.032	1.0150	3.89	0.1671	3.54
8.200	200.00	11.350	11.350	0.005	0.005	1.0150	3.78	0.1432	4.19
8.200	250.00	14.125	14.125	0.005	0.005	1.0150	3.81	0.1141	5.24
8.200	300.00	21.380	21.379	0.025	0.025	1.0150	3.71	0.0723	8.36
9.000	50.00	13.490	13.489	2.268	2.268	1.0150	4.26	0.0870	5.91
9.000	100.00	11.092	11.091	2.328	2.328	1.0150	3.84	0.1212	4.47
9.000	150.00	9.495	9.494	2.278	2.278	1.0150	4.20	0.1292	4.01
9.000	200.00	9.661	9.660	2.328	2.328	1.0150	3.84	0.1406	3.86
9.000	250.00	10.839	10.839	2.318	2.318	1.0150	3.91	0.1226	4.38
9.000	300.00	15.849	15.848	2.328	2.328	1.0150	3.85	0.0835	6.48
10.000	50.00	9.716	9.715	1.751	1.751	1.0150	3.82	0.0793	6.16
10.000	100.00	7.586	7.585	1.741	1.741	1.0150	3.88	0.0976	4.97
10.000	150.00	6.166	6.165	1.741	1.741	1.0150	3.91	0.1198	4.04
10.000	200.00	6.683	6.683	1.731	1.731	1.0150	3.94	0.1061	4.54
10.000	250.00	10.233	10.232	1.731	1.731	1.0150	3.90	0.0695	6.95
10.000	300.00	13.490	13.488	1.741	1.741	1.0150	3.85	0.0549	8.86
11.000	50.00	5.012	5.011	1.243	1.243	1.0150	3.83	0.0599	7.40
11.000	100.00	3.715	3.715	1.213	1.213	1.0150	3.91	0.0730	6.01
11.000	150.00	3.311	3.311	1.223	1.223	1.0150	3.91	0.0834	5.27
11.000	200.00	3.631	3.630	1.203	1.203	1.0150	3.93	0.0726	6.03
11.000	250.00	7.328	7.327	1.233	1.233	1.0150	3.84	0.0401	11.03
11.000	300.00	9.661	9.659	1.243	1.243	1.0150	3.81	0.0315	14.11
12.000	50.00	2.901	2.901	0.687	0.687	1.0150	3.78	0.0602	6.79
12.000	100.00	2.371	2.371	0.607	0.607	1.0150	3.88	0.0747	5.41
12.000	150.00	2.175	2.175	0.627	0.627	1.0150	3.85	0.0811	5.00
12.000	200.00	2.265	2.265	0.657	0.657	1.0150	3.82	0.0774	5.26
12.000	250.00	3.981	3.981	0.687	0.687	1.0150	3.79	0.0437	9.35
12.000	300.00	4.217	4.217	0.707	0.707	1.0150	3.76	0.0414	9.90

DIELECTRIC PROPERTIES OF OIL SHALE

SAMPLE NO. AX A10-03P

FRLQUENCY GHZ	TEMP CELSIUS	VSWR MEASURED	VSWR CALCULATED	DMIN MEASURED CM	DMIN CALCULATED CM	SAMPLE THICKNESS CM	DIELECTRIC CONSTANT	LOSS TANGENT	PENETRATIO DEPTH CM
8.200	50.00	17.783	17.782	3.012	3.012	1.0150	4.09	0.0943	6.11
8.200	100.00	12.303	12.302	2.882	2.882	1.0150	5.14	0.1190	4.32
8.200	150.00	10.351	10.350	2.772	2.772	1.0150	5.93	0.0898	5.33
8.200	200.00	15.311	15.310	3.002	3.002	1.0150	4.16	0.1109	5.16
8.200	250.00	19.724	19.724	3.002	3.002	1.0150	4.17	0.0853	6.69
8.200	300.00	27.861	27.860	3.002	3.002	1.0150	4.18	0.0600	9.49
9.000	50.00	13.646	13.645	2.228	2.228	1.0150	4.51	0.0752	6.64
9.000	100.00	21.014	21.013	2.288	2.288	1.0150	4.12	0.0584	8.96
9.000	150.00	8.222	8.222	2.208	2.208	1.0150	4.68	0.1157	4.25
9.000	200.00	11.350	11.349	2.268	2.268	1.0150	4.26	0.1040	4.94
9.000	250.00	17.783	17.782	2.288	2.288	1.0150	4.12	0.0692	7.56
9.000	300.00	24.266	24.265	2.298	2.298	1.0150	4.05	0.0516	10.22
10.000	50.00	6.761	6.760	1.691	1.691	1.0150	4.10	0.0885	5.33
10.000	100.00	4.732	4.731	1.681	1.681	1.0150	4.20	0.1185	3.94
10.000	150.00	4.074	4.073	1.661	1.661	1.0150	4.30	0.1242	3.71
10.000	200.00	5.158	5.158	1.661	1.661	1.0150	4.25	0.1008	4.60
10.000	250.00	10.000	9.999	1.681	1.681	1.0150	4.11	0.0579	8.13
10.000	300.00	13.183	13.181	1.691	1.691	1.0150	4.06	0.0459	10.31
11.000	50.00	2.113	2.113	1.083	1.083	1.0150	4.17	0.0927	4.58
11.000	100.00	1.496	1.496	1.033	1.033	1.0150	4.29	0.1183	3.55
11.000	150.00	1.413	1.412	1.053	1.053	1.0150	4.29	0.1265	3.32
11.000	200.00	1.585	1.585	1.023	1.023	1.0150	4.28	0.1114	3.77
11.000	250.00	3.162	3.162	1.103	1.103	1.0150	4.10	0.0659	6.50
11.000	300.00	4.097	4.097	1.113	1.113	1.0150	4.07	0.0524	8.21
12.000	50.00	3.255	3.255	0.487	0.487	1.0150	4.05	0.0600	6.58
12.000	100.00	2.661	2.661	0.395	0.395	1.0150	4.17	0.0847	4.60
12.000	150.00	2.585	2.586	0.395	0.395	1.0150	4.17	0.0870	4.48
12.000	200.00	2.661	2.661	0.395	0.395	1.0150	4.17	0.0847	4.60
12.000	250.00	5.309	5.309	0.502	0.502	1.0150	4.05	0.0362	10.92
12.000	300.00	5.957	5.957	0.502	0.502	1.0150	4.05	0.0322	12.25